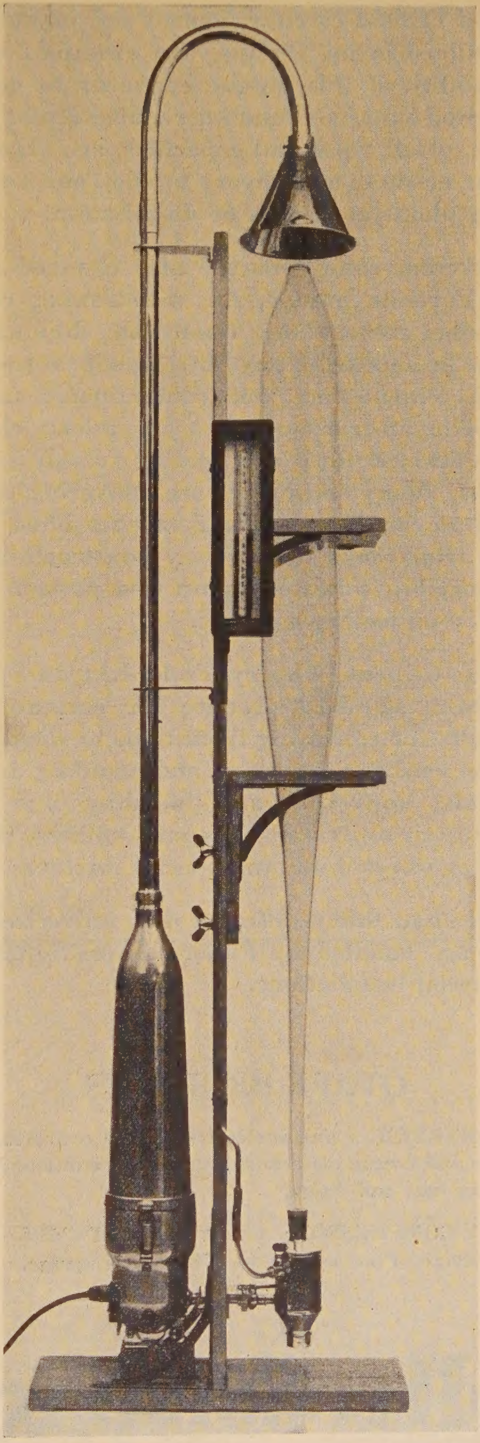
MILL SECTION of

Concrete

QUICK DETERMINATION OF FINES....

THE increasing fineness to which high grade portland cement is now pulverized has created the need of an improvement in the methods for making tests for fineness. The finer the cement or other material is pulverized, the greater becomes the necessity for quick, accurate fineness determinations. Mechanical sieving is not satisfactory for the extreme fines.



THE FLS SEPARATOR

is made to meet the demands for the quick, accurate determination of the amount of "fine flour" in cement or other pulverized material. This separator, illustrated, is compact, precise, and easy to operate. When once charged, the machine needs no attention during the short time consumed in making a test.

The F.L.S. Air Separator is delivered tested and standardized.

The intimate relation existing between the strength of the cement and the size of the individual particles in the cement increases the importance of the test by air separator. The F.L.S. Separator is a necessary requisite for all laboratories when great fineness determinations are made.

◆

Write for particulars

F. L. SMIDTH & COMPANY
Engineers
225 Broadway New York, N. Y.

Index to Advertisers on Page 79 of This Section

FULLER-KINYON SYSTEM

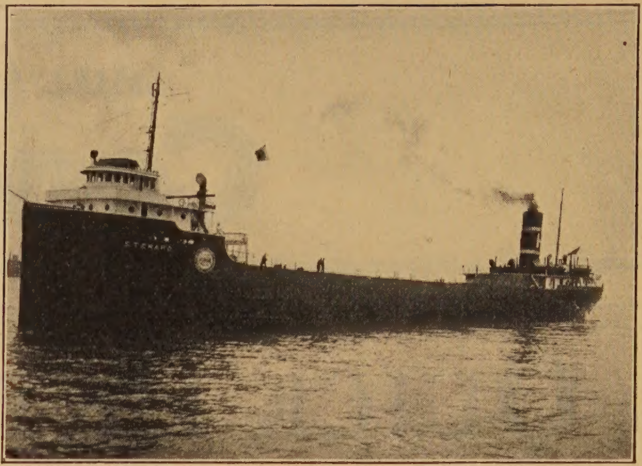
the all-purpose conveyor of cement

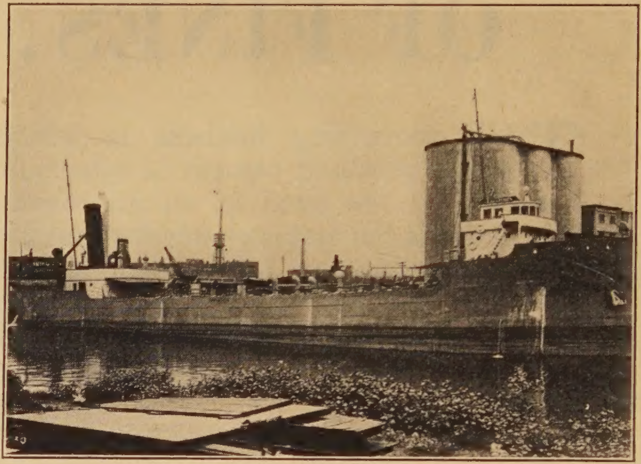
BULK cement carriers, loaded and unloaded by Fuller-Kinyon Pumps, are examples of the adaptability of this unique conveyor to unusual pulverized materials handling requirements. These vessels, of all types and capacities, are expanding cement markets by delivery to silos and concrete mixing plants at centers of distribution.

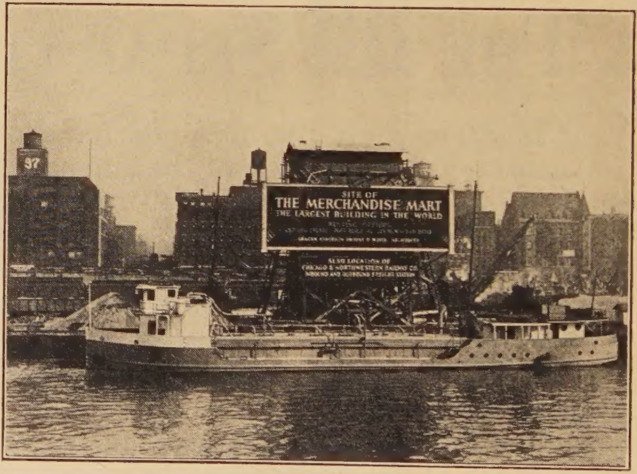
Marketing conditions are also changed at the mill. Portable pumps, for withdrawing cement from silos are enabling immediate shipments in bags or in bulk from any bin. Standard, tested or special cements are not contaminated, as the Fuller-Kinyon transport lines are quickly cleared. Water-jacketed lines are cooling freshly ground cements. Many consumers are delivering cement from box cars to mixer and batcher bins. After severe trials on state highway construction, our new portable collector pump has proven to be ideal for unloading box cars.

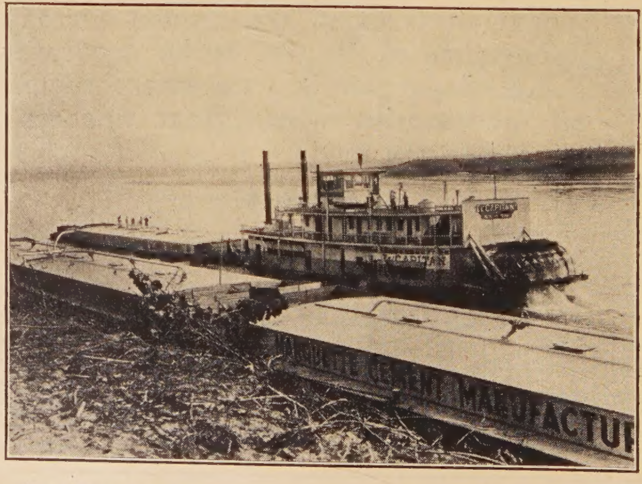
In the Cement Industry, Fuller-Kinyon Systems have been standard practice for several years, especially for conveying from mills to silos. They are also used for conveying and blending dry raw materials; conveying and blending flue dust; handling air-separator fines and tailings, packer spill, bag-wheel dusts and special mixtures.

More than thirty different dry, pulverized materials are handled by Fuller-Kinyon Systems in commercial installations.









OTHER PRODUCTS

THE AIRVEYOR, a pneumatic system for conveying fine, granular and coarse materials, especially recommended for unloading cars and boats.

ROTARY COMPRESSORS AND VACUUM PUMPS. Single and two stage. Pressures up to 170 pounds, gauge.

Fuller Company
CATASAUQUA, PENNA. U. S. A.

Index to Advertisers on Page 79 of This Section

MILL SECTION of
Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 38 January, 1931 Number 1

CONTENTS

First Wet Closed Circuit Grinding Installation is Great Success *(Illus.)* 81
Lewis R. Sims describes the satisfactory results secured at the Dewey plant at Davenport, Iowa.

Existence of Tricalcium Silicate Upheld by Scientists 87
Prof. Dr. Guttmann and Dr. Brille explain results of X-ray analysis.

Editorial 89
Prospects for 1931.
The Fittest Will Survive
Mill Workers' Interest in Excess Capacity.

German Cement Companies Merging to Put Industry on Sound Basis 90
Two European correspondents tell what is happening in Germany.

Sources of Green Colors For Use With Portland Cement 92
The sixth and last of E. T. Ellis' articles on cement coloring agents.

Universal Atlas Bulk Cement Barge Launched in Formal Ceremony *(Illus.)* 97
Brief description of the middle western company's marine unit.

Cement Statistics for November *(Illus.)* 99

Men and Mills 100

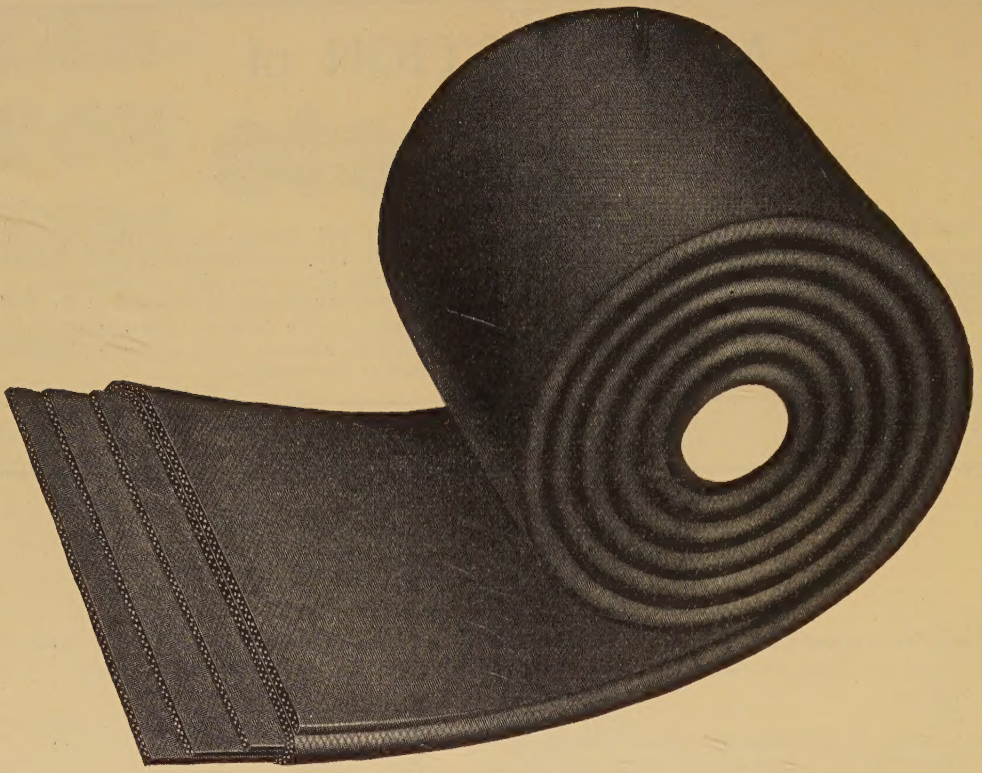
About Manufacturers of Equipment 101

Forty-nine Plants Have No Accidents in First Ten Months *(Illus.)* 102

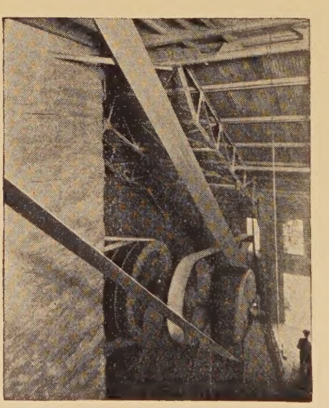
Copyright, 1930, by Concrete Publishing Co.

INDEX TO ADVERTISEMENTS

Allis-Chalmers Mfg. Co. 103
Autocar Co. 11
Babcock & Wilcox Co. 105
Burrell Eng. & Const. Co. 106
Caldwell & Son Co., H. W. 104
Chemical Rubber Co. 102
Engineering & Designing 74
Fuller Co., The 78
Fuller Lehigh Co. 107
Goodyear Tire & Rubber Co. 80
Jones Fdry. & Mch. Co., W. A. 108
Kritzer Co., The 74
Meade, Richard K., & Co., Inc. 74
Smidth, F. L., Co. 77
Super Cement Co., The 76



This newest Goodyear Belt saves trouble for you



The Goodyear Thor Belt, seamless*—a new construction for 1931—represents a radical improvement in belting for cement-making machinery. On Fuller and Lehigh Mills, Hammer Mills, Fans, and Coal Pulverizers it will save delay and trouble. The edges are protected by a splitless and seamless envelope. The belt is guarded from fraying at the edges and from tearing in the center. It is built of tough silver duck—cushioned and cured between plies with rubber—very strong at the fasteners. This new Goodyear belt will keep your machinery operating at top efficiency.

Goodyear Thor Belting, seamless, is applied to your work by the G.T.M.—Goodyear Technical Man. He is an expert in belting practice. He saves time and expense. He fits belting and all other Goodyear Mechanical Rubber Goods—Hose, Molded Rubber Goods, and Packing—to the needs of your own plant and machinery. To learn of the assistance he can be in your business, just write to Goodyear, Akron, Ohio, or Los Angeles, California.

**Goodyear Thor Belting, seamless, is made in widths up to and including 16″—Thor quality of special construction is available for larger sizes*

THE GREATEST NAME IN RUBBER

GOODYEAR

BELTS ◆ MOLDED GOODS ◆ HOSE ◆ PACKING

MILL SECTION of
Concrete

Vol. 38 Chicago, January, 1931 No. 1

First Wet Closed Circuit Grinding Installation Is Great Success

Dewey's Davenport Plant Increases Output from 70 to 167 Barrels Per Mill-Hour—Unit Power Consumption Cut in Half—Finished Product Much Finer and Quality Higher

By LEWIS R. SIMS
Assistant Chief Engineer, Dewey Portland Cement Co.
Davenport, Iowa

Here is the detailed story of a remarkable achievement in closed circuit grinding. A large increase in mill output, much finer grinding, greatly reduced unit power consumption, are a few of the results attained. The story as told by Mr. Sims is in the language of one operating official to another.

The cement industry is under distinct obligation to Vice-President H. F. Tyler, in charge of operations at the Dewey Portland Cement Company's Davenport plant, for his broadminded attitude in permitting this story to be told for the good of the industry.

We urge similar co-operation from other cement mill executives in order that the Cement Mill Section of CONCRETE may perform the greatest possible service as a medium for the exchange of information leading to improved quality and lower production costs.—The Editors.

SINCE closed circuit grinding, both on the raw and finish ends, seems to be the topic of the hour, considerable interest has been centered about the closed circuit installation at the Davenport, Iowa, mill of the Dewey Portland Cement Company. This installation, pioneered by H. F. Tyler, first vice-president and in charge of operations at Davenport, is the first application of wet closed circuit grinding to cement manufacture.

A tremendous amount of preliminary study was given to the subject prior to the adoption of the process, because of the many phases which were presented by this problem. The major problem was to meet an increased demand for more and finer raw material, and since American disc slurry filters, manufactured by Oliver United Filters, Inc., were to be installed at the same time to effect a saving on coal and to increase production they were brought into the consideration.

The Problem

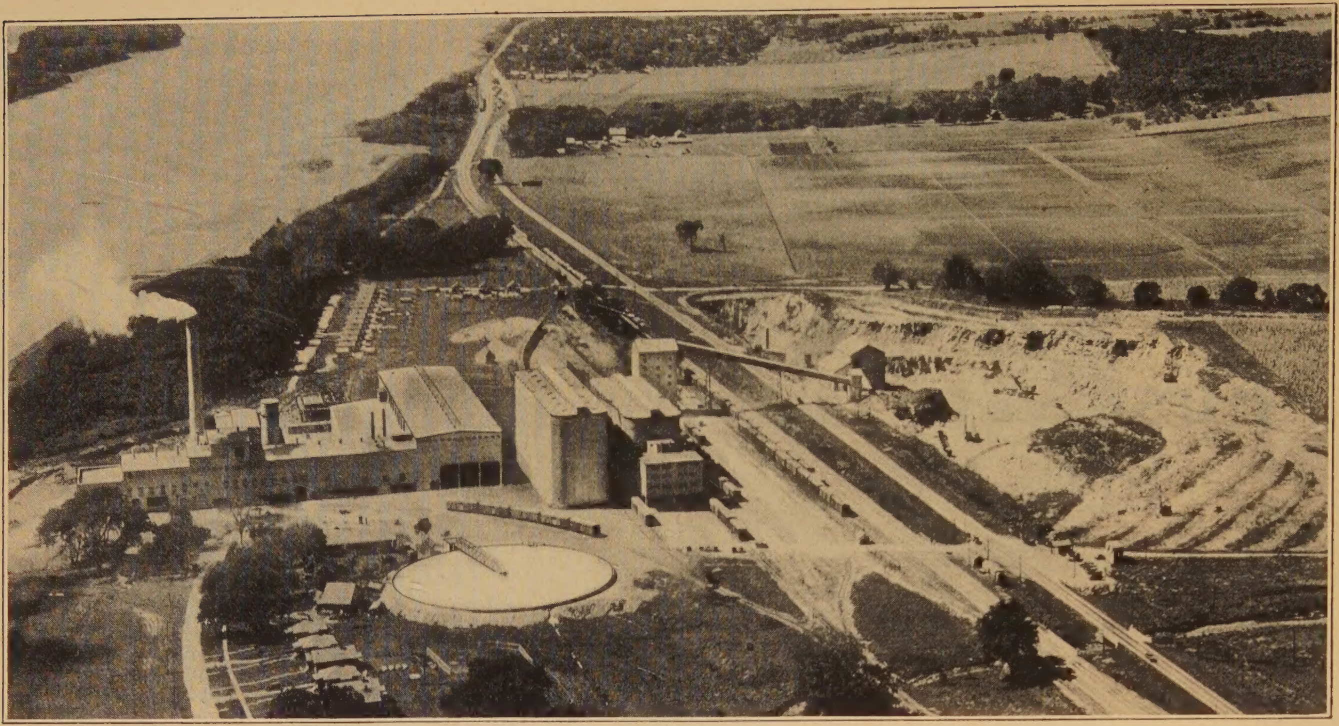
At the time the problem was taken up the raw material was prepared for grinding by one 42-in. gyratory crusher, one 50 by 52-in. hammermill, and two No. 4 hammermills. An average sieve analysis of this product is as follows:

8 per cent plus ¾-inch
45 per cent plus 4-mesh
82 per cent plus 28-mesh

and of the 18 per cent passing the 28-mesh sieve 6 per cent was minus 200-mesh.

Further reduction was then made to 89 per cent minus 200-mesh in three 7 by 26-ft. Allis-Chalmers compeb mills. Primary compartment discharge was through ⅜ by 2-in. slots in the grid plates and the primary compartment was charged with 4-in. forged steel balls. The secondary compartment balls were 1¼-in. This set-up was good for an average of 70 barrels (21 dry tons) per mill hour.

Since the finish mills are located in the same room as the raw mills, and adjacent to them, they have the same dimensions, and the same feed bins served by the same overhead crane; and since the matter of increasing the capacity of the finish grind was inextricably tied up in the whole problem they came in for their share of discussion. Several times during the preparation of tentative plans, one of these finish mills, at least, entirely lost its identity as a finish mill and became a raw mill. Indeed, during the installation of the machinery described



Airplane view of Dewey Portland Cement Co. plant at Davenport, Iowa. The traction thickener, 225 ft. in diameter, may be seen in foreground

in this paper, one 7 by 26-ft. mill served in a dual capacity—first as a wet mill grinding raw material, then for three or four days on the other side of the picture, grinding clinker. The change from wet to dry required eight or nine hours while the change from dry to wet required only two or three hours.

Early in the study of the problem it became apparent that preparation of a smaller compeb mill feed was an economic necessity. Elimination of everything above minus ⅜-in. was a comparatively easy step, so this was the first part of the problem that was disposed of. Just what contribution to the increase in production this step made cannot be positively determined because this measure was not taken separately.

Some of Tentative Plans Considered

It was anticipated that a maximum demand of 5400 barrels (1600 dry tons) per day would have to be met. One of the suggested plans was to change one of the 7 by 26-ft. finish mills into a raw mill, thus boosting the capacity of that department to a maximum of 6000 barrels (1880 dry tons) per day, then make up the deficiency introduced by this change into the finish grinding department, as well as provide for the increased demand for clinker grinding capacity, by installing two preliminary clinker grinding units. While this plan of adding two mills possessed several very desirable features its principal drawback was its very large power requirements. Since our connected load was already very near the peak of our ability to produce with present power plant equipment, this added power demand would have made intermittent operation a strong possibility. Consequently this plan was never seriously considered.

Another tentative plan called for two additional 7 by 26-ft. mills; one for raw grinding and one for grinding clinker. Here again the power requirements were so great that adoption of this plan would have put us in very much the same position as described above.

It must be remembered that at this stage we were not in a position to know just what would happen to the exit gases after the change from 36 per cent moisture slurry to 19 per cent moisture filter cake, and upon this factor, of course, depended our ability to generate power.

All things considered, it seemed reasonable to suppose that the change would produce higher temperature and greater volume of exit gases; but since inquiry revealed a wide variety of experiences on this score—some higher temperatures, some lower and some with no apparent change in temperature—and we seemed to have no substantial basis for comparison, we were very shy of any plan which called for any considerable additional power requirements.

Furthermore, the plans so far outlined provided no means of lowering the raw fineness, a thing we were looking forward to as being not only highly desirable, but perhaps necessary in the not far distant future.

Closed-Circuiting Seemed Best Solution

Investigation of the possibilities of closed-circuiting the wet mills revealed the likelihood of our being able to get along with two 7 by 26-ft. mills on raw material. There would then be released for finish grinding one wet mill, and thus both of our major problems would be solved with one stroke.

This necessitated a bold step, but since the plan involved an actual reduction in total k.w.h. required to grind even the proposed larger requirements of raw material, and since this probable reduction was sufficiently great to offset the additional k.w.h. required to grind the larger amount of clinker, the closed circuit system looked very good. And in addition to this, the likelihood of obtaining better control of the fineness was so great—

a consideration which other plans failed to satisfy fully—that the plan was adopted.

Some apprehension was felt concerning the facility of controlling the mix because of "the slack in the wire" due to the detention period in the thickener; but because of the above-mentioned desirable features this bridge was left to be crossed when reached.

Physical Changes at the Plant

In order to install the machinery necessary to close the circuit on these mills a number of physical changes were required. To provide a place for the bowl classifiers the roof of the motor room, which was 32 by 150 ft., was raised some 12 feet. The columns were extended and strengthened and a second floor was added. These columns were of plate and angle construction and were strengthened by welding four 3 by 6-in. angles to the plate.

The "D," or primary classifiers, were supported on steel bents erected between these 7 by 26-ft. mills.

The nearest suitable site for the thickener was at a point three hundred feet from the mill room. Since the bowl classifiers were to be placed at an elevation approximately twenty feet higher than this, gravity feed was possible to the thickener, and no serious objection appeared to this location.

The two raw mills chosen to be closed-circuited were somewhat modified. The primary grid plates were replaced by ones having an opening of ⅝ by 2-in. slots, thus increasing the open area some 35 per cent. The peripheral screens were removed, and 10-in. pipe feeders were installed in the primary compartment for the purpose of introducing these sands from the primary classifier. This latter addition was made because it was felt that the trunnion openings were insufficient to handle the large circulating load.

The 4-inch pumps handling the mill discharge were replaced by 6-inch pumps. The 4-inch pumps were placed in a pit at the feed end of the mill to elevate the primary compartment discharge to the primary classifier.

There was no change made in the total ball charge in the mill as far as quantities were concerned. The grinding balls in the secondary compartment, however, were changed from 1¼ in. to ⅞ in. in size.

Description of Equipment and Process

Essentially the process is a means of extracting from the raw material stream each particle as it reaches a predetermined fineness. This is for the dual purpose of increasing the output of the mill and affording a more positive control of the fineness. To accomplish this purpose a classifier is installed in closed circuit with each compartment of the mill, a large circulating load is maintained, large quantities of water are used, and finally, dewatering of the finished product is effected to reduce the moisture to a point corresponding to normal or near normal slurry.

In this installation the primary feed is introduced into the mill in the conventional manner with the usual amount of water. The primary compartment discharge is elevated to the primary classifier. By examining the accompanying flow diagram this and each succeeding step should be readily apparent. The classifier is so well named that its function is apparent. Water is introduced into this primary classifier in quantities sufficient to dilute the pulp to a point where the large particles (called sands) will drop to the bottom of the mass, from where they are raked up the classifier deck and reintroduced into the primary compartment through the two 10-inch pipes referred to in an earlier paragraph. Primary classifier overflow, finished primary material (called pulp), flows by gravity into the sump which also receives the discharge from the secondary compartment of the mill.

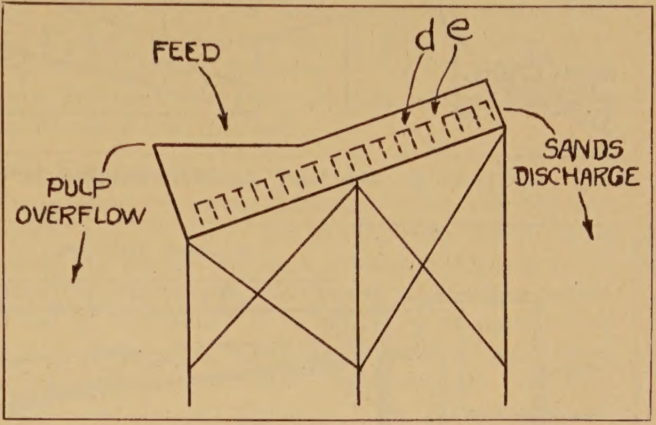


Figure 1. The "D," or primary, classifier

To accomplish further classification than would be possible by simply diluting the classifier feed, water is introduced at "d" and "e" (see Figure 1), for the purpose of removing any of the finer particles which may be adhering to the sands.

The Bowl Classifier

The bowl classifier, the one which is installed in closed circuit with the secondary compartment of the mill, is of somewhat different construction than the primary classifier, and is also a much larger piece of machinery. The differences in construction and size are not due to any different principle involved in the function it is required to perform, but solely because separation at this point is directed at the minus 200-mesh particles. What was a dilute mass overflowing from the primary classifier and joining the pulpy mass discharging from the secondary compartment on the mill is all further diluted to a thin slime upon entering the secondary, or bowl classifier. This dilution greatly increases the volume to be handled, and the velocity and turbulence of the mass must be restricted to a point where only minus 200-mesh particles will remain in suspension. These requirements must be met by a sufficiently increased area over which to operate.

As will be seen from Figure 2, which is drawn to the same scale as Figure 1, the bowl classifier has rotating rakes as well as reciprocating rakes. The diameter of the bowl in which the rakes operate is 25 feet and the overall length of the entire classifier is 48 feet. When fully loaded the entire weight amounts to about 200,000 pounds.

The feed, together with additional water, enters this secondary classifier as indicated and is directed downward. The larger particles (sands) settle to the bottom while the finer particles move with the water toward the periphery of the bowl. In doing this they spread out over a larger area with a consequent reduction in velocity.

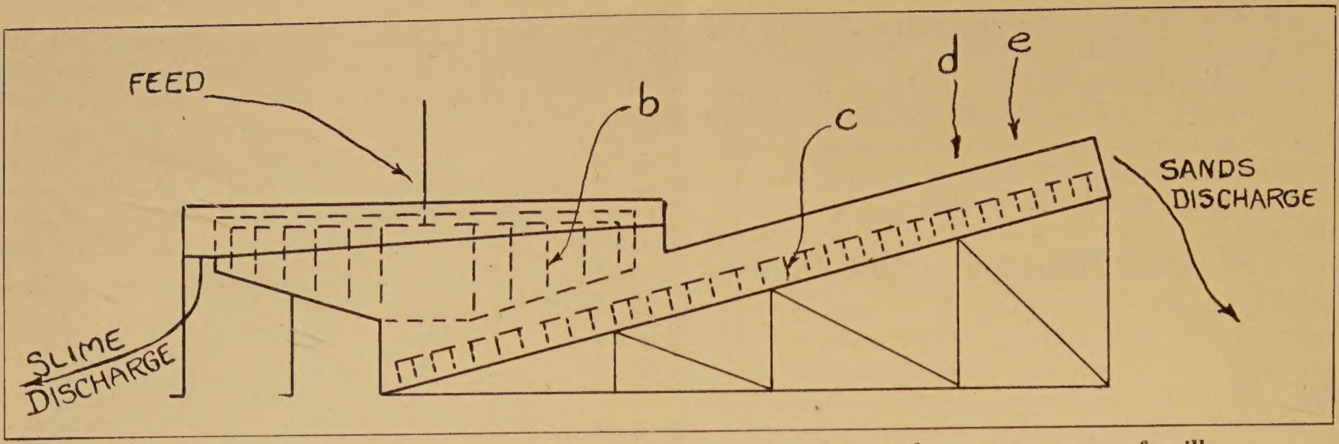


Figure 2. The bowl classifier, installed in closed circuit with secondary compartment of mill

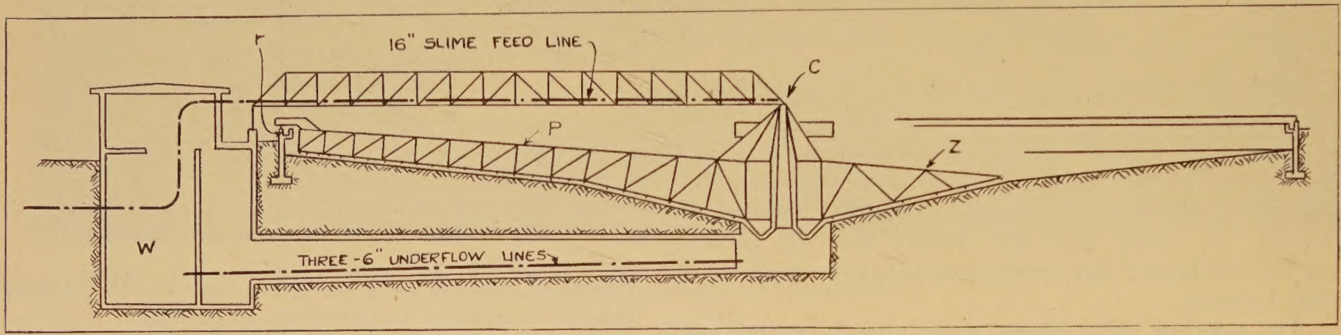


Figure 3. The traction thickener

This action results in a further settling of the particles which are plus 200-mesh and continues until the periphery of the bowl is reached, where only minus 200-mesh material remains in suspension. Dilution at this point is then about 7 to 1, and this thin slime constitutes classifier overflow. The fractional r.p.m. of the rotating rakes "b" is calculated not to over-agitate the slime, yet to travel with sufficient velocity to dispose of the settled sands down the conical bottom of the bowl to a point where they will drop into the area of the reciprocating rakes "c" and thus be conveyed up the incline and washed in the same manner as described for the "D" classifier in the primary circuit. Here, however, separation being aimed at the minus 200-mesh particles, the classifier has been provided with a raking area 200 per cent greater, the rakes travel 18 to 20 strokes per minute as against 25 to 30 in the smaller machine, and the slope of the raking compartment is somewhat less.

The material which has been rejected by this classifier constitutes the secondary compartment feed, and is conducted to the secondary compartment feed well by means of a screw conveyor and open gravity launder. The clay slip from the wash mill is also introduced into the circuit at this point. It will be seen that the bulk of this material rejected by the classifier is circulating load, because the second compartment discharge is considerably greater than primary classifier overflow.

The Traction Thickener

To return to the bowl classifier overflow: This thinly diluted slime is conducted by gravity through a 16-in. pipe to a Dorr traction thickener, Figure 3, where it is dewatered to a density approaching that of an ordinary slurry.

In this installation, the thickener is 225 feet in diameter, 7 feet deep at the circumference and 22 feet deep at the center. There is a drive truss spanning the radius of the thickener as indicated at "p" and three shorter members 90 degrees apart, one of which is shown at "z." Curved blades, constructed on the order of the curved blades in the bowl compartment of the bowl classifier, are mounted on all four members and conduct the slowly dewatering mass to the three points of discharge in the center discharge cone. These moving members have a velocity of one and one-half revolutions per hour.

A steel trussed bridge spans the radius and is fitted with a walkway. Power lines for feeding the collector rings which pick up the current for propelling the drive truss cross this bridge. A 16-in. welded pipe line for delivering the slime to the center of the thickener, a 4-in. water service line, a 2-in. air service line and a slurry recirculation line cross this bridge. The recirculation line is for returning the dewatered slime (slurry) from sump "w" back into the thickener in the event it is not possible to otherwise dispose of it. Since the solids are constantly settling out of the slime and must not be permitted to form a slurry too thick to pump, this recirculation line is an essential part of the equipment. From this it will be seen that the drive truss must not be permitted to cease functioning for any very long period of time. To insure immediate attention in the event the drive truss stops, an underspeed alarm is a regular item of equipment. This alarm sounds a warning that can be heard in both the mill and motor rooms.

The slime is discharged from the 16-in. pipe at "a" into a feed box where the stream is broken up and robbed of much of its velocity before entering the thickener. The mass moves with ever decreasing velocity toward the circumference of the thickener, the solids dropping below the surface and the water discharging in a thin sheet over the edge of the thickener into launder "r" carrying appreciably less suspended solids than the adjoining river into which it is discharged. This water would be reused were it not for the fact that there is an unlimited supply more readily available.

Addenda

While the foregoing is a description of the process as it operates today, mention should be made of efforts that were directed toward classifying the mill feed. Since this mill feed always contains some minus 200-mesh material which should not be put into either compartment, and much minus 35-mesh material which should be extracted and diverted to the secondary compartment, some means should be provided to effect this separation.

In many applications of wet closed circuit grinding made in the metallurgical industries it is customary to introduce the mill feed to the primary classifier and give the primary grinding unit, or compartment, a prepared feed. To have done this at the Davenport plant would have involved so many physical changes of a major nature that it was decided to construct a special drum having peripheral screens and introduce the feed to the mill through this drum where all materials sufficiently small to properly by-pass the first compartment would be screened out and join the stream coming from the first compartment discharge on its way to the primary classifier. It was recognized that such a step was an experiment in the purest sense of the word and that little time could be allotted to its trial unless it gave early promise of some real performance.

When installed, the screening part of the operation was satisfactory but the drum failed to develop sufficient power to put the oversize into the mill. The drum was redesigned and worked over in an effort to overcome this deficiency but it was still incapable of handling the volume required of it.

Operating Results

The installation has been in use since June of this year and the following is a detailed summary of operating data gathered since that time.

Capacity

The average output per compeb mill hour during 1929 was 70.1 barrels. The average output since changing to closed circuit grinding has been 167 barrels, with a maximum of 200 barrels per hour. Thus the average output has been increased 138.2 per cent.

Power Consumption

The average unit power consumption for grinding during 1929 was 5.5 k.w.h. per barrel. With closed circuit grinding this average has been reduced to 2.85 k.w.h. per barrel. The latter figure was determined during a twelve-day test in September. It is interesting to note that of this 2.85 k.w.h., 2.26 k.w.h. were required for driving the mills and 0.59 were used for driving the classifiers, thickener and circulating pumps. This decrease was well within the estimates prepared and amounts to a reduction of 48.2 per cent.

Grinding Media Consumption

A decrease in the consumption of steel balls has been registered. The steel consumption was formerly 0.086 pounds per barrel in the primary compartment, and 0.321 pounds per barrel in the secondary compartment. At the present time the former figure has been reduced to 0.057 and the latter to 0.112. This amounts to a saving of 33.7 per cent in the case of the primary media and a saving of 65.1 per cent of the secondary charge.

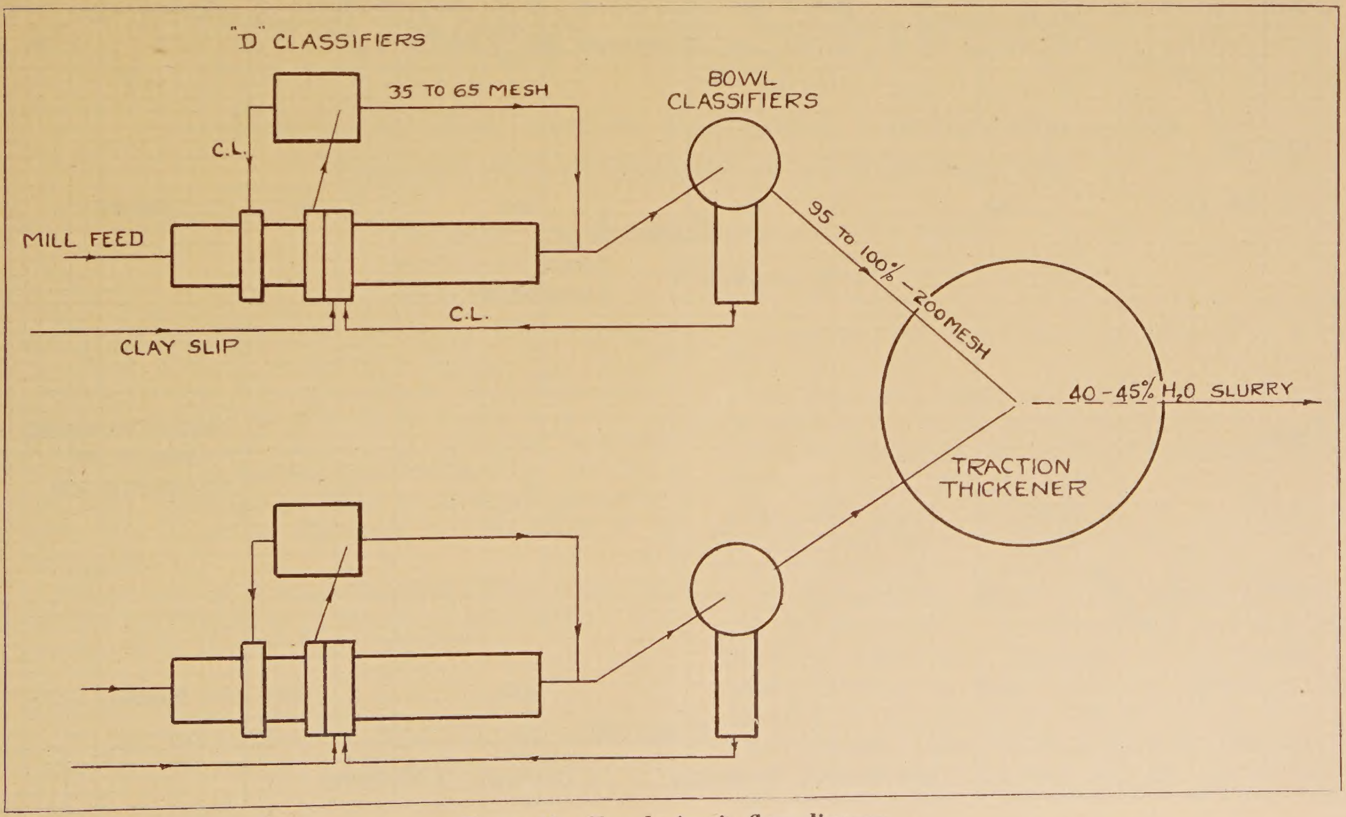


Figure 4. Closed circuit flow diagram

Fineness of Grinding

During 1929 the average sieve analyses show 89 per cent passing 200-mesh and 5 per cent retained on the 100-mesh. Under closed-circuit conditions the average fineness has been raised to 97.5 per cent minus 200 with nothing retained on the 100, while at times under close supervision, and with the mills turning out approximately 150 barrels per hour each, the fineness has been held to 99.9 per cent minus 200 and 95 per cent passing the 325-mesh sieve. The following tables show the size distribution by screen analyses, elutriation tests and microscopic examination:

A study of these particle size determinations indicates:

(a) An elimination of stray oversize coarser than critical size.

(b) A substantial reduction in plus 200-mesh material.

(c) Adequate proportions of superfines.

Since the adoption of closed circuit wet grinding the calcium carbonate content of the slurry has been held at satisfactory levels. The free lime in the clinker has been held consistently low, as indicated by soundness tests on pats and occasional analyses. Of these analyses more will be said later.

SIEVE TESTS

	Open Circuit		Closed Circuit	
Mesh	Per cent	Per cent cumulative	Per cent	Per cent cumulative
20	1.00	1.00	......	......
28	.25	1.25	......	......
35	.50	1.75	......	......
48	.50	2.25	......	......
65	.75	3.00	......	......
100	2.00	5.00	......	......
200	6.00	11.00	2.60	2.60
325	Not recorded		8.40	11.00

ELUTRIATION TESTS ON UNDERSIZE FINENESS

		Open Circuit		Closed Circuit	
	Mesh	Per cent	Per cent cumulative	Per cent	Per cent cumulative
Jar 1	340*	10.70	21.70	16.60	27.60
Jar 2	540*	7.80	29.50	5.90	33.50
Jar 3	820*	3.40	32.90	6.70	40.20
Jar 4	1400*	8.40	41.30	8.00	48.20
Overflow		58.70	100.00	51.80	100.00

(*Average size of particle determined by microscopic examination.)

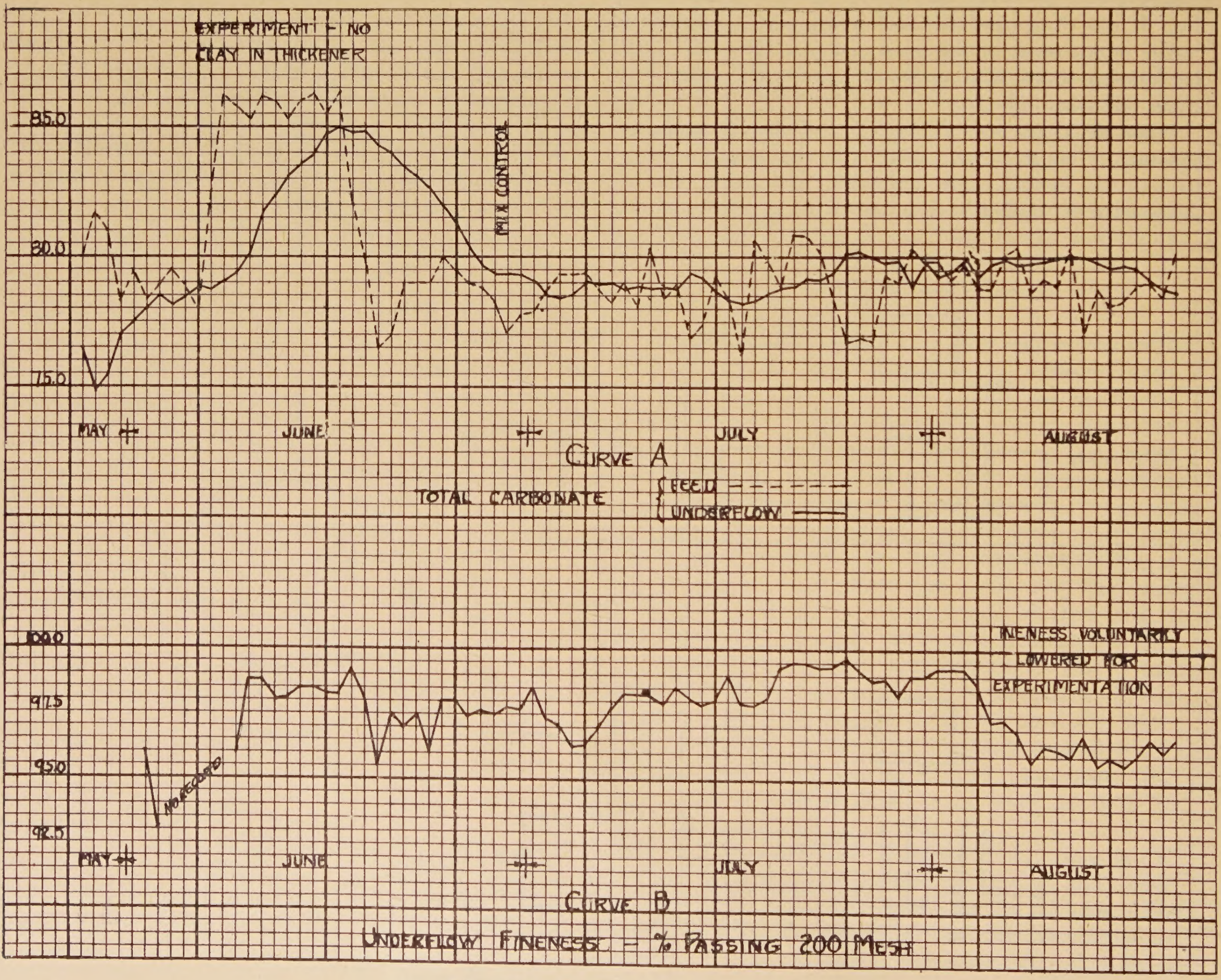


Figure 5. Performance curves

The figures given below represent average tensile strengths before and after the installation. No great amount of attention has so far been given to building up the strength, so these comparative figures indicate only the trend, which is obviously in the right direction.

TENSILE STRENGTHS—LBS. PER SQ. INCH
On 1:3 Mixes
WITH STANDARD OTTAWA SAND

	1 Day	7 Days	28 Days
Open circuit, Jan., Feb., Mar., Apr., 1930	128	330	430
Closed circuit, June, July, Aug., 1930	178	356	451
Closed circuit, Sept., Oct., Nov., 1930	Not yet available		

Kiln Capacity Increased

Previous mention has been made of the increased kiln capacity, the record being as follows:

Open Circuit Grinding, 1929	4600-4800 Bbls. per day
Open Circuit with Filters, 1930	5400-5600 " " "
Closed Circuit with Filters, 1930	6000-6700 " " "

Absence of Free Lime

In grab samples taken on six different days over a period of one month early in the operation on the closed circuit, the following free lime determinations were made:

Sample	CaO
A	None
B	None
C	None
D	None
E	1.25
F	1.39

This was before any attempt whatsoever had been made to establish closer control over the burning operation, and at a time when higher kiln capacities than ever before were being maintained.

Control

It was stated earlier in this article that when formulating plans for the installations some uneasiness was felt concerning the mix control, because of the detention period in the thickener. It now develops that homogeneity is obtained in the underflow by the equalizing action of the thickener. This can be seen by an examination of curve "A," in Figure 5.

Curve "B" shows underflow fineness.

In conclusion it might well be added that all this has not been accomplished without the usual amount of grief—perhaps more than the usual amount. Experience has shown that pioneering any new step involves shouldering a large amount of trouble, and this project was not without its exasperating moments.

Existence of Tricalcium Silicate Upheld by Scientists

Assert Dr. Brill Draws Erroneous Conclusions—Offer Explanation of Results of X-Ray Analysis

By PROF. DR. A. GUTTMANN and DR. F. GILLE
Dusseldorf

"TRICALCIUM-SILICATE" is the title of an article by R. Brill, published in *Zement,* No. 34, 1930, which reproduces X-ray photographs of tricalcium-silicate and bicalcium-silicate obtained by Professor Jänecke. As the two pictures show an amazing agreement, Brill comes to the conclusion that tricalcium-silicate does not exist as such, and represents a mixture of bicalcium-silicate with lime. The following comments may be made in this connection:

The production of pure tricalcium-silicate is extremely difficult and laborious, as seen from the following directions given by Hansen[1] and Dyckerhoff.[2]

First Hansen Process

(a) 2.3 Mol $CaCO_3$ + 1 Mol SiO_2 are mixed well, placed in platinum foil or platinum crucibles and heated in an electric muffle for an hour at a temperature of 1500 deg. C.

(b) The heated sample is allowed to cool and is again ground, carefully combined with 0.3 Mol finely pulverized $CaCO_3$ and heated for an hour at a temperature of 1500 deg. C.

(c) The substance obtained in (b) is again finely ground, combined with 0.3 Mol $CaCO_3$, mixed well and heated for an hour at a temperature of 1500 deg. C.

(d) Following procedure (c), the sample is combined with 0.1 Mol $CaCO_3$, is thoroughly ground and again heated for an hour at a temperature of 1500 deg. C.

(e) Following procedure (d), the sample is again ground fine and heated for an hour at 1500 deg. C.

The substance obtained by Hansen by means of the above process contained traces of free lime beside the small crystals of tricalcium-silicate of low double refraction.

Translated from *Zement,* Sept. 25, 1930, by Margaret A. Corbin.

[1] W. C. Hansen: *Journ. Amer. Cer. Soc.,* vol. 11, p. 68, 1928.

[2] W. Dyckerhoff, Dissertation phil. Frankfurt, p. 32, 1925.

Second Hansen Process

(a) A mixture of 4 Mol $CaCO_3 + 1$ Mol SiO_2 is heated for one hour at a temperature of 1500 deg. C.

(b) The heated sample *a* is ground, mixed with enough distilled water to form a stiff paste and again heated. (The water serves to hydrate the free lime, still present, and increase its reactivity.)

(d) The sample *b* is again ground, mixed with water and again heated.

(e) Sample *d* is treated with a hot alcohol solution of glycerine and neutralized with a hot alcohol solution of ammonium acetate, washed with absolute alcohol and again heated. (Titration of the substance with ammonium-acetate in glycerine-alcohol solution has the purpose to eliminate all excess lime added at the beginning.)

(f) Sample *e* is again treated as in *e* and heated.

(g) Sample *f* is heated for 48 hours at a temperature of 1500 deg. C.

Sample *f* was analyzed by Hansen and yielded almost exactly the theoretical composition of $3CaO.SiO_2$.

	Determined from Analysis	Theoretical
CaO	73.62	73.59
SiO_2	25.88	26.41
Al_2O_3	0.29	-------
Loss on ignition	0.03	

Aside from the weakly refracting crystals of tricalcium-silicate with a refraction index of 1.715, the sample contained only traces of more highly refracting crystals and only traces of free lime.

Samples, prepared in accordance with the two sets of instructions, agreed with the X-ray photograph of tricalcium-silicate reproduced by the authors.[3]

Dyckerhoff Process

A finely pulverized mixture of 3 $CaO + SiO_2$ is heated to about 1600 to 1800 deg. C. (If necessary, heating is repeated upon pulverizing, until chemical and optical analyses establish the uniformity of the sample.)

Both processes agree in that they stop short of the temperature of decomposition of tricalcium-silicate (about 1900 deg. C.).

At this deterioration point, located below the point of fusion, and at temperatures above it, the following reaction takes place:

$$3\ CaO.SiO_2 = 2CaO.SiO_2 + CaO$$

Shepherd, Rankin and Wright[4] comment as follows: "This reaction is reversible; at any rate, one should expect it to take place slowly, as the phases are solid and gaseous (that is, no longer solid, fluid and gaseous as at the time of crystallization of the melt). The time element acquires considerable importance, when the sample is fused and again crystallizes into crystals of lime and orthosilicate of relatively large dimensions. Under favorable conditions, the above combine to form tricalcium-silicate, yet at an exceedingly slow rate."

If Jänecke obtains his sample by first fusing and subsequently tempering at 1500 deg. C. for only 3¼ hr., it is to be expected in all probability that fusion will result in considerable quantities of bicalcium-silicate and free lime, which cannot recombine to form tricalcium-silicate. due to the short and simple (without repeated pulverizing) tempering.

It is, therefore, hardly amazing to find that his would-be tricalcium-silicate yields the X-ray photograph of bicalcium-silicate. Chemical and microscopic investigations of the X-rayed samples should convince Brill of the accuracy of this explanation.

Comment by Dr. Brill and the Authors

I wish to make the following remark concerning the above: Messrs. Guttmann and Gille accept my X-ray evidence as such. They criticize the method of preparing the investigated sample. To solve the problem of whether tricalcium-silicate exists or not, we will ask them to submit to us a sample of what in their opinion is correctly produced tricalcium-silicate, which we will proceed to analyze by all means at our disposal.

I wish to add at this time, that the illustration in my article "Tricalcium-Silicate" was accidentally inverted. It should be viewed turned through 180 deg.

DR. R. BRILL.

In accordance with Dr. Brill's wish that we furnish him with a true sample of tricalcium-silicate (and bicalcium-silicate for the sake of comparison), we will do so at the earliest opportunity, although the preparation of such samples is so accurately described in the literature referred to by us, that any colleague who has the required muffles at his disposal can carry it out successfully. As long as Brill has investigated a sample which cannot be proved to be pure tricalcium-silicate, he can hardly deny its existence in the face of the precise data given us by Hansen and others.

A. GUTTMANN and F. GILLE.

Fuller Lehigh Works to Barberton, Ohio; Offices to New York City

Manufacturing operations of the Fuller Lehigh Company are to be transferred from Fullerton, Pa., to the Barberton, Ohio, works of the Babcock & Wilcox Company. Management, engineering and sales departments will move to New York City.

No definite date has been set for these changes but it is expected that they will be made early in 1931.

The corporate identity of the Fuller Lehigh Company will be maintained, according to an official announcement, but in some cases the personnel will be merged with that of the parent company, the Babcock & Wilcox Company.

Sales offices of the two companies are now located close to each other, and the erection and service departments of the two concerns have been combined for some time, so the change in location of Fuller Lehigh manufacturing, sales and engineering represents an important step in co-ordinating the activities of the two organizations.

E. G. Bailey, president of the Fuller Lehigh Company, has been elected a vice-president of the Babcock & Wilcox Company.

Penn-Dixie Buys 550 Acres of Quarry Land

The Pennsylvania-Dixie Cement Company has arranged to purchase 550 acres of quarry land near Winterset, Iowa, at a cost of about $80,000. The company will begin working the land next spring, shipping the rock to its plant at Valley Junction.

---

[3] Chem., microscop. and X-ray studies of Alite, *Zement*, No. 30, 1929. CONCRETE, September, 1929.

[4] *Zeitschr. f. anorgan. Chemie*, vol. 71, p. 25, 1911.

EDITORIAL

Prospects for 1931

CEMENT manufacturers, not without reason, are looking at this time for every source of reliable information that will aid them in estimating probable cement consumption in 1931.

By far the most comprehensive analysis we have seen on this subject appears in a 24-page special supplement on the building industry, issued under date of December 3, 1930, by the Standard Statistics Company, Inc., of New York. While the analysis covers the 5-year period from 1930 to 1934, inclusive, the immediate prospects for 1931 are given special study.

In the matter of public works and public utilities construction, which comprises a very substantial part of the cement market, the coming year should exceed the 1930 record. In addition to the continued activities of state highway departments there is the further stimulant from the large bond issues voted in the November elections, the large federal government construction program just announced, and the campaigns now under way to increase expenditures for state and local improvements in order to combat the unemployment situation.

Construction work as a whole, including all classes of engineering and building construction, should be maintained almost at 1930 levels during the first half of the year, by which time the construction industry should have gathered sufficient momentum to finish the year at a somewhat advanced rate.

This excellent analysis does not promise anything spectacular for 1931, but it does predict that substantial foundations will be laid for an upturn in construction activity at or near the end of the year.

The Fittest Will Survive

THE cement manufacturing situation in Germany, reported in this issue by one of our German and one of our British correspondents, has many aspects that deserve careful study by cement manufacturers in North America.

The cement industry in Germany is in the actual process of merging into a few powerful groups. In the United States and Canada the trend has already started in that direction.

Each of the German groups is concentrated in a fairly well defined geographical area of its own. On this side developments are not as yet headed in that direction, but such possibilities are worth thinking about.

Apart from the actual mergers, accomplished or about to be accomplished, the sales branch of the German cement industry is divided into three selling syndicates, one in the west, one in the north and one in the south. These syndicates are having their difficulties, especially in the west, where one concern produces 75 per cent of the total output of the group. North American business psychology would make the operation of such a plan extremely difficult, if not impossible, on this side. The British plan, where marketing associations coincide with the physical mergers, is better adapted to our ways of conducting business.

Finally, a most far-reaching possibility in the German situation is the prospect that, as one result of the present movement, some of the out-of-date and superfluous plants will be closed down. This action is expected to permit the producing capacity of the great modern plants to be utilized to a much higher degree than in recent years, especially after general construction work begins to revive.

This last-named movement is one toward which a well defined trend is clearly seen in the United States and Canada. Plant owners and managers who have the vision to see ahead and the ability to raise the necessary capital are modernizing their mechanical equipment and pushing their research to the utmost. Lower production costs and better cement are the definite results that are actually being attained.

Under these circumstances there can be only one prospect ahead for the plant that continues to operate with obsolete equipment. That one prospect is an eventual closing down. It is the age-old law of the survival of the fittest. The law has operated in this manner in other industries, and the cement industry will not be an exception.

Mill Workers' Interest in Excess Capacity

IF the present excess of capacity over production is increased still further in the cement industry, through the ill-advised promotion and construction of new plants, the inevitable result will be that the annual operating period of existing plants will be shortened and cement manufacture will become more and more seasonal.

Ordinarily the production of cement reaches its low point in February, but January and March are almost as low. Lengthening of the present low production period will cause the dumping of an army of workmen on the unemployed labor market at the very beginning of winter.

This will add more complications to the difficulties of winter unemployment and will make a solution impossible so far as this industry is concerned.

Cement mill executives, with the interest of workers as well as manufacturers at heart, are justified in discouraging the construction of new plants. They should not hesitate to bring the facts to the attention of communities where new plants are being promoted.

German Cement Companies Merging to Put Industry on Sound Basis

Outside Interests Built More Plants While Demand Was Falling—Price Collapse Now General—Expect Superfluous and Poorly Equipped Mills to Be Closed

The German portland cement industry, faced with problems not unlike those of the industry on the North American continent, but in even more acute form, has taken an aggressive attitude in the matter of finding a solution. It is expected that the mergers being effected will result in the closing down of some mills with out-of-date equipment, especially those that are not well located geographically.

The American portland cement industry may well draw its own conclusions from these developments.—The Editors.

By A. C. BLACKALL
London, England

A MOVE of great importance has just been taken in the German cement industry, which constitutes a big step toward the formation of an immense cement trust. A year ago a community of interests was established between the Silesian Portland Cement Industry, in Oppeln, on the one hand, and the Portland Zement Werke Heidelberg-Mannheim-Stuttgart, the E. Schwenk Cement and Stone Works, in Ulm, and the Dyckerhoff und Sohne Portland Cement Works, in Mainz, on the other hand. The Silesian portland cement industry and the big Heidelberg group of cement works now propose a closer association based on an exchange of capital, which is to be submitted to the several general meetings to be held shortly.

Technical difficulties prevent the Dyckerhoff Company and the Schwenk firm from joining the formation at once, but it is anticipated that they will join in the near future, and the necessary negotiations are already being conducted by the Heidelberg group on the one hand and the Dyckerhoff and Schwenk interests on the other.

Second Transaction

A second great transaction is in progress by means of which the Schlesische Portland Zement A. G. is establishing a community of interests, with a pooling of profits, with the Sachsisch-Thuringische Portland Zement Fabrik and the Adler Deutsche Portland Zement Fabrik A. G. As the Silesian company is already financially interested in these two Central German enterprises, which themselves have a marketing agreement with the South German group, a very powerful cement concentration is in process of formation.

Further Mergers Likely

While so far no precise negotiations are in progress among the smaller cement firms, it is thought probable that still further fusions will be arranged in the near future, one great object of the present movement being to close down out-of-date and superfluous works in order that the producing capacity of the great modern works may be utilized more efficaciously. The new Interessen Gemeinschaft will endeavor to persuade the strong Wicking group to collaborate with it. In 1929 the production of the Silesian group was about 50,000 truck loads; that of the Adler group about 40,000; that of the South German (Heidelberg-Mannheim-Stuttgart) group about 70,000, and that of the Dyckerhoff Company approximately 60,000 truck loads. Opposed to this block is the production of the Wicking concern, which in 1929 was only about 55,000 truck loads.

* * *

By GRAF A. von KERSSENBROCK
Berlin-Grunewald, Germany

THE economic conditions in the German cement industry have altogether turned to the worse during 1930. The chief reason is to be found in the dull situation in the building trades, with hardly any building operations going on, whereas, on the other hand, the capacity of the cement industry has been enlarged by the erection of new factories.

The following figures show the shipments of cement (portland cement, iron portland cement and slag cement) in the years indicated:

	1928	1929	1930
January	334,355	175,908	315,000
February	501,968	85,652	294,000
March	664,931	426,971	571,000
April	678,351	815,730	570,000
May	756,798	844,784	656,000
June	763,380	825,775	523,000
July	776,829	867,310	576,000
August	777,981	786,631	512,000
September	764,224	728,103	510,000
October	680,901	676,777	453,000
November	556,077	499,214	
December	320,418	306,462	
Total	7,576,224	7,039,317	

Prices Collapse

The change for the worse especially affected western Germany. But in central Germany also a heavy depression is to be noted, leading just as in the western provinces to a total collapse of prices. The aspects of the outside factories—that is, those cement works which have been erected within the last years, and which do not belong to the syndicates—are especially disadvantageous. Of these there are altogether 16 in western Germany, compared with 15 factories belonging to the Western German Syndicate, the latter having by far the greater capacity.

Recently cement prices have, as mentioned before, fallen rapidly in Germany. The decline of prices is far greater than with any other building material. In the western and central markets of Germany the reduction of prices reaches nearly 20 per cent, and even more, of the original factory price. Earnings can not be expected under these conditions and even amortization has become uncertain.

Drop Erection of New Plants

In view of these difficulties and the present uncertainty, all schemes for the erection of new cement works have been dropped, and capitalists have withdrawn from new ventures. If the Western German Syndicate, which is to expire with the end of the year, should be renewed there will be hardly a chance for a better outlook, even with the works belonging to the syndicate. The general slump in raw materials will certainly continue to affect cement factories unfavorably.

Selling Syndicates Have Their Troubles

Apart from these difficulties, which weigh heavily, but which are more or less the result of the world depression, and the crisis Germany is going through again at present, there are further circumstances which affect the industry. There is the question, for instance, whether to renew the selling syndicates or not. The German cement industry, as combined in the "Deutscher Zement-Bund," is divided into three selling syndicates, the North German Syndicate at Berlin, the Western German Syndicate at Bochum, and the South German Syndicate at Heidelberg. It has been difficult in recent years to keep the western syndicate together, and the renewal was accepted only for one year each time. Now, with the Wicking concern controlling more than 75 per cent of the output of that syndicate and with its new big plant at Neuwied, directly on the banks of the Rhine, it seems almost impossible to bring the interests of Wicking into harmony with those of the other members in western Germany. The difficulties with the outside firms, as mentioned above, have also to be taken into consideration.

How Mergers Are Accomplished

The pooling of interests between the Mannheim-Heidelberg-Stuttgart Cement Co. and the Silesian Cement Corp. is to be regarded as a result of this situation. A year ago those two big cement groups came to a special agreement with an eye to further and more intimate co-operation. According to an announcement of the firms the two groups will exchange shares to the amount of 7,000,000 marks and five members of the board of directors of the Heidelberg-Mannheim-Stuttgart Co. will enter the "Aufsichtsrat" of the Silesian Corp., and four members of the Silesian group enter the South German concern. The agreement as to co-operation existing between the two groups and the Dyckerhoff Co. will not be altered by the new arrangement. Within the Silesian group the consolidation is continued to the extent that between the Prüssing Cement Co. and the Adler Cement Co. a special agreement as to a pooling of interests is drawn up and a common administration for both companies will be formed. To the shareholders of Prüssing and Adler this is of special importance because the yearly dividend of Prüssing and Adler is guaranteed by an agreement to the effect that Prüssing shareholders shall have two-thirds of the dividend of the Silesian Corp. and the Adler shareholders four-tenths of that dividend beginning with 1931.

Portland Cement Industry in Spain for Decade is Reported On

A thorough report on the portland cement industry in Spain, especially covering the period from 1920 to 1929, inclusive, will be found in a 101-page, 9½ by 11½-inch illustrated report issued in October, 1930, by the Ministerio de Formento (Ministry of the Interior) of the Spanish government.

During the period from 1920 to 1929, inclusive, the production of portland cement is reported as having increased from 329,000 to 1,556,000 tons. From 1920 to 1927, inclusive, the consumption of cement was practically identical with the volume of production; but in 1928 and 1929 consumption was higher than production. Each year in the period covered saw an increase over the previous year in both production and consumption.

Other data in the report include the annual sales of portland cement, by provinces, for the period 1920-1928; a map showing the location of cement mills in Spain; and comparisons between production and capacity. Considerable space is given to cement statistics in the nature of comparisons between the industry in Spain and that in other countries.

Alpha Plant Four Years Without Accident; Medusa Meeting

Four years of accident-free operation—the second longest record in the industry—were completed by the Alpha Portland Cement Company's Ironton, Ohio, plant with the close of the year. The 1930 record was clear up to the middle of December, according to the latest report made.

L. D. Patterson is chairman of the safety committee and Frank C. Brownstead is superintendent of the plant.

The first annual "no accident year" banquet and business meeting of the employes of the Medusa Portland Cement Company plant at Dixon, Illinois, took place on November 15th.

President J. B. John, Vice-President E. J. Maguire, General Superintendent W. L. White, Jr., Safety Director W. M. Powell of the head offices at Cleveland, Ohio, and H. A. Parish, safety director for the Chicago & North Western railway of Chicago, addressed the gathering.

International Completes Improvements at Two Plants; Begins on Another

Both the New Orleans and the Dallas plants of the International Cement Corporation are completing reconstruction programs and the Houston plant will next be improved.

The Lone Star Cement Company, Texas, began its extensive reconstruction program last spring at its West Dallas plant. The installation of an additional 374 by 10-ft. kiln was made at the Lone Star Cement Company, Louisiana, plant at New Orleans.

Sources of Green Colors for Use With Portland Cement

Chromic Oxide Green Available from Many Unexploited Sources — Cost Much Lower Than from More Usual Sources—Conclusion of Series on Colored Cement

By E. T. ELLIS, F.J.I.
Ecclesall, Sheffield, England

In each of the five preceding articles[1] on cement coloring agents mention has been made of one important fact—that the coloring of cement is an entirely subsidiary process. The tinting of cement can not be carried out during the actual manufacture of it, but must always take place after the portland cement has been manufactured in the usual way.

None the less, the separation of the cement from the pigment is frequently difficult, and sometimes practically impossible. —The Author.

THE very best brands of portland cement should always be selected as the starting point in the manufacture of green cements. Other cements, namely, those which are outside the portland group, are less satisfactory for employment, though some of them have been tinted green more or less successfully.

Some Green Cements

Quite a substantial demand has already been made in Europe for what are known as all-green cements. From these the blue-greens and yellow-greens are excluded, these being quite difficult to prepare. The pale green and the dark green hues are included. These shades merge into each other, and can be varied at will by the actual amount of green pigment employed. With yellow-greens and blue-greens it is necessary to add an additional color, which neither reacts with the original green nor with cement, and which itself is sufficiently permanent not to be acted upon by atmospheric conditions. It will not be necessary to give more than three shades of green here, since these are quite sufficient for all ordinary requirements.

Green is a restful and attractive color, and cements tinted green harmonize well with the surroundings. The use of green cement mortars is specially desirable when greenish building stones or bricks are employed, or when concrete blocks made of green aggregates are used. Roofing tiles made of green cement are far more desirable. and more restful in appearance, than those of a bright red hue.

Chromic Oxide Green

An extremely large number of green pigments have been introduced. Most of these are quite unsuitable for use as cement makers' coloring agents. For our purpose, therefore, attention will be limited to chromic oxide green, which goes under a great variety of other names, but which must be carefully distinguished from chromium trioxide, which is not green, and which is soluble in water. In most instances it consists chemically of chromium sesquioxide, but there are forms which are usable as pigments in the cement coloring trade which consist of chromic hydroxide or mixtures of chromic oxide and hydroxide. Permanence is again a matter of the greatest possible importance. Nearly all the cheap green pigments are very liable to change, either in contact with the cement itself, or under the influence of the atmosphere. This is specially the case if the atmosphere is charged with chemical vapors from factory chimneys. Chromic oxide green is undoubtedly as stable a pigment as we can secure for our present purpose, but it is not quite so chemically inert as elemental carbon. Its insolubility or practical insolubility in water makes it very much more suitable for coloring cements than mixtures of yellows and blues, some of which are appreciably soluble in water, forming a greenish solution of some density.

Chromium salts which are in themselves entirely unsuitable for use as coloring agents for green cements can often be manipulated both easily and cheaply, so as to render them either ideal for the purpose in view, or actually to transform them into chromic oxide green itself. The main object of manipulation is either to get the chromium into a soluble state or to prepare a soluble or insoluble compound of chromium, which when treated with reducing agents will become so altered in composition that the oxide or mixture of oxide and hydroxide is thrown down, the color usually being developed by subsequent calcination. Cement makers should, therefore, give most careful attention to all these details before they reject any cheap chromium-containing substance as being entirely outside their scope.

Unexploited Sources of the Coloring Agent

No less than twenty-seven unexploited sources of chromic oxide green deserve attention. While the following are probably the most readily accessible of all, cement manufacturers should by no means conclude that this substantial number comprises the only ones, and should always keep a most careful lookout for others. The number of soluble, sparingly soluble, or insoluble substances containing chromium which are suitable directly or indirectly for the preparation of chromic oxide green for coloring cement might easily be multiplied by five if space were available for commenting on them.

The following is a list of the twenty-seven unexploited sources to which I would like to direct special attention:

Ammonium chrome alum waste liquors,
Barium chromate by-products,

---

[1] Cement Mill Section of CONCRETE, August, 1928, pages 95-96; May, 1930, pages 103-105; June, 1930, pages 103-105; November, 1930, pages 81-86; and December, 1930, pages 81-85.

Chromate refuse and residues,
Chrombleispath ore offal,
Chrome spinel spoil bank junk,
Chromeisenstein quarry or mine waste,
Chromeglimmer aluminous offal,
Chromic iron ore offal,
Chromium acetate industrial effluents,
Chromium borate by-products,
Chromium chloride waste waters,
Chromium iron sulphide mine offal,
Chromium nitrate trade waste waters,
Chromium potassium sulphate chemical solutions,
Chromium sulphate waste solutions,
Chromjernalm junk,
Chromoferrite ore industry offal,
Chrompicotite belt pickings,
Crocoisite or crocoite waste,
Malanchroite mine waste,
Phoenicite or phoenicochroite pickings,
Potassium chromate industrial effluents,
Potassium dichromate waste waters,
Redingtonite rough refuse,
Sodium chromate waste solutions,
Sodium chrome alum unwanted liquors,
Sodium dichromate industry effluents.

Most of these substances possess little if any green color to start with, though many are themselves tinted. While it is claimed that the liquids containing chromium are the most easy to manipulate, I am far from being in agreement with this statement, for they are often very dilute. Cement makers should, therefore, not be unduly keen on purchasing waste liquors which may contain only very small quantities of chromium held in solution or in suspension.

Manufacturing Methods

Each of the above unexploited sources of the green coloring agent requires some manipulation. The main details are briefly summarized below. Those who require detailed discussions are advised to consult advanced treatises, mainly on inorganic chemistry, but in a few instances, especially with the chrome alums, on organic chemistry.

Ammonium Chrome Alum Waste Liquors. These are by-products from the organic chemical industries, and in some instances the alum is available in a solid form in addition to this waste liquor. The solid should be dissolved in water and filtered while the liquors themselves should at once be filtered to remove suspended impurities, which are often large in amount. Evaporation to dryness is the next step, and the ammonia is then driven off by heating the alum, following which the chromic oxide coloring agent can be obtained by manipulating the calcined alum in the same manner as that to be described later under Chromium Sulphate Waste Solutions.

Barium Chromate By-Products. This is a solid waste material which can be picked up from time to time. It should be concentrated on an endless band if at all lumpy, and well washed with water if in the form of a coarse powder.

Subsequently, dissolve it in nitric acid, and filter off suspended or insoluble matter. Chromic sulphate, not chrome alum, should then be added, although the latter is cheaper and is often recommended. The object is to precipitate the barium in the form of the sulphate, which should be filtered off. To the filtrate, add ammonium hydroxide, and if excess of this is avoided, the pure compound can be evaporated and crystallized out if necessary. It should be redissolved in water and boiled with sodium carbonate solution, which precipitates the chromium as hydroxide or a mixture of oxide and hydroxide. This last should be well washed, dried, ground, and if necessary calcined, to develop the color.

Chromate Refuse and Residues. These consist very largely of lead chromate. The first step consists of concentrating them on an endless band, unwanted impurities being got rid of quite readily provided that the material itself is coarse. It should then be ground up, and dissolved in cold lime water, impurities being filtered off. The lead can be precipitated by the addition of sulphuric acid, a second filtering then being necessary. Following this, it may be necessary to add some potassium carbonate, and lastly the liquor should be boiled with sulphur in order to precipitate the chromic oxide or mixture of oxide and hydroxide. This should be filtered off, and ignited to develop its color.

Chrombleispath Ore Offal. This consists essentially of lead chromate, and can either be exploited in the manner just described, or in the different manner described under Malanchroite Mine Waste, farther on.

Chrome Spinel Spoil Bank Junk. This waste product is very difficult to get into solution, and in order to reduce the initial difficulties very severe concentration on an endless band is absolutely necessary, to reduce the content of other silicates to the lowest possible point. Following this the concentrated chrome spinel should be finely ground, and fused for a prolonged period with potassium bisulphate. The mass should then be lixiviated either with hot or cold water, and acidified, filtering off impurities which are largely insoluble. In most instances it is not necessary to neutralize with carbonates, and direct boiling with finely divided sulphur is all that is necessary to throw the chromic oxide down. This should be filtered off, well washed, and calcined to develop its color.

Chromeisenstein Quarry or Mine Waste. This consists largely of a form of ferrous chromite, and in addition to the method described below it may be exploited in the manner mentioned farther on when speaking of Chromic Iron Ore Offal.

The best method is to concentrate it with great severity on an endless band arrangement in order to throw out the largest possible amount of unwanted junk. The concentrated chromeisenstein waste should then be finely stamped, and fused with a mixture of potassium carbonate and lime, although other potash-containing and lime-containing materials have been used with a fair amount of success. The cold mass is lixiviated with water, and impurities filtered off, the filtrate being acidified, and again filtered. Following this, boil the liquor, and then add thereto a boiling solution of white arsenic, not in excess. This will produce a precipitate of chromic hydroxide, which should be well washed, dried, and ignited to develop its color.

Chromeglimmer Aluminous Offal. This consists largely of aluminum potassium chromium silicate, but in most samples a very large quantity of unwanted aluminum is present, either as a separate silicate or as an oxide. Much of this can be got rid of by careful concentration on an endless band, following which the selected samples of the simple silicate should be ground up, and fused with sodium carbonate or potassium carbonate, lime usually being added to make fusion more difficult, but to render oxidation easier. The cold mass is then lixiviated with water, and as far as possible sparingly soluble impurities filtered off. Evaporation of the liquor is the next step, and either washing soda or pearl ash should be added in the form of a solution, filtering off the deposited sulphate immediately. The chromate solution which remains is then directly boiled with sulphur to throw down the chromic oxide or mixture of oxide and hydroxide, the precipitate being filtered off, dried, ground, and if necessary re-ignited to develop its color.

Chromic Iron Ore Offal. This offal consists of small pieces of ferrous chromite mixed with a large amount of earthy gangue, shale, and oxides of other metals. Very severe concentration on an endless band arrangement is necessary, as otherwise the offal is hardly worth while bothering with. Following this, grind it up, and calcine it, not to the point of fusion, with a mixture of potassium carbonate and lime, until all the iron has been oxidized to the ferric condition, and all the chromium oxidized to the chromate. The cold mass should be lixiviated as usual with water, and sparingly soluble matters filtered off. If it is now again acidified with sulphuric acid, further sulphates will be got rid of on cooling by mechanical filtration. Following this, sulphur dioxide should be pumped through, and the precipitated chromic hydroxide or mixture of oxide and hydroxide filtered off, dried, and ignited to develop its color.

Chromium Acetate Industrial Effluents. These are sometimes available in the textile and other trades, but are often so dilute that they are not worth bothering with. All solutions containing as low a quantity as 1 per cent of the acetate should be declined at once, as the cost of exploitation will be much too great.

Two methods are available, one for very dilute solutions, and the other for the more concentrated types.

The dilute solution should be introduced into multiple evaporating pans, and reduced by about one-third in bulk, following which mechanical filtration should be arranged for. Ammonia gas should be pumped in, or ammonia solution added, boiling to avoid partial solubility of the precipitated hydroxide therein. This is then filtered off, dried, and calcined to develop its color.

For more concentrated chromium acetate industrial effluents, it is advisable to evaporate down to about one-third, with or without a preliminary filtration, and then to filter off all substances which appear to be unwanted impurities. The liquor should then be evaporated to dryness, and the acetate heated to decompose it. A mixture of chromium carbonate and oxide as a rule remains, and this, if thoroughly calcined, will develop into a fine green color.

Chromium Borate By-Products. From time to time parcels of this solid substance can be picked up, and exploitation in this instance is easy. The by-product should first of all be sifted, and then boiled with water in order to hydrolize it. Repeated washing is necessary to free it from soluble impurities, following which the liquor should be decanted off, and the precipitate dried, ground, and if necessary calcined, to develop its color.

Chromium Chloride Waste Waters. Waste waters containing appreciable quantities of chromium chloride are sometimes available. Cement men should buy these if not too dilute, but should have nothing to do with liquors which contain only 1 per cent of the chloride.

Concentration in multiple evaporating pans is the best step to take, filtering first, and filtering again when the bulk has been reduced by one-third, one-half, or two-thirds. Further evaporation may be necessary, but a saturated solution of the chloride is not necessary. When a strong solution has, however, been obtained, sodium carbonate solution should be added thereto, and the precipitated hydroxide or mixture of oxide and hydroxide filtered off, well washed, dried, and ignited to develop its color.

Chromium Iron Sulphide Mine Offal. This is a complex sulphide of iron and chromium, as its name suggests, but is so cheap in some districts that the elaborate method of exploitation is well worth carrying out.

First of all, concentrate it severely on an endless band arrangement, to get rid of earthy gangue. The small pieces of sulphide should then be ground up, and dissolved in nitric acid, filtering off sparingly soluble impurities, and oxidizing the liquor by means of ammonium persulphate solution, followed by boiling.

Iron can be precipitated by the addition of ammonium sulphide or carbonate, following which it should be filtered off. Then the liquid should be neutralized if necessary, with soda ash, and boiled with sulphur to throw down the chromium, the precipitated hydroxide being washed, dried, and calcined to develop its color.

Chromium Nitrate Trade Waste Waters. Large quantities of these are not as a rule available, but small quantities, if quite concentrated, are well worth buying. All liquors, however, containing only 1 per cent of the nitrate should be declined.

In many instances a preliminary filtration of chromium nitrate trade waste waters is necessary, following which they should be evaporated and boiled. Ammonium hydroxide solution, or sodium carbonate or sodium hydroxide, or even potassium carbonate solution, should be stirred in, and the precipitate washed, dried, and ignited to develop its color. In those instances where iron is present it must be separately precipitated.

Chromium Potassium Sulphate Chemical Solutions. These fall within the alum group. Solutions of considerable concentration are usually offered, while in a few instances the solid substance itself with a large amount of water of crystallization is available. This last should be dissolved and filtered, while the solutions themselves should be filtered to start with. Potassium carbonate in the form of a solution should be added, and as there is slight solubility in excess, the liquor should be boiled prior to filtering, and the precipitate well washed, dried, and ignited to develop its color.

Chromium Sulphate Waste Solutions. All liquors containing only 1 or 2 per cent of the sulphate should be declined at once, as these are not worth while troubling with. Producers frequently have much more concentrated solutions, but wilfully dilute them with water in order to increase their bulk, and then call attention to the fact that the chromium can readily be precipitated from them without evaporation in pans to any extent.

Best results are obtained if sparingly soluble impurities are filtered off to start with. Then introduce the clean liquor into concentration pans of the multiple type, filtering again once or twice, as the liquor decreases in bulk. Potassium sulphate solution should then be added in a concentrated state, and the alum crystallized out, and purified by recrystallization from water free from carbon dioxide, if necessary. Following this, the method just described under Chromium Potassium Sulphate Chemical Solutions should be adopted to obtain the chromium oxide green for coloring cements.

Chromjernalm Junk. This is a form of ferrous chromite which usually contains a large amount of impurities of varied nature. Cement men will, however, obtain good results if they make up a mixture of 10 parts of chromjernalm junk, 40 parts of lime, and 40 parts of feldspar.

This combination should be calcined at redness, with agitation for about two days, and when cold the mass should be lixiviated with water, and potassium carbonate added. Impurities can be got rid of by mechanical filtration, and this should be followed by concentration, and acidification with hydrochloric acid, alcohol being added. This solution is then heated, and the hydroxide or mixture of oxide and hydroxide precipitated by the addition of ammonia solution. The liquor is decanted off, the precipitate freed from the rest by mechanical filtration, and washed, dried, ground, and ignited, if necessary, to develop its color.

Chromoferrite Ore Industry Offal. This again is a form of ferrous chromite, and one way of exploiting it is that already described when speaking of Chromic Iron Ore Offal above.

A much more elaborate method of exploiting it has, however, been devised, which may be adopted in the case of the richer forms. The first step consists of very severe concentration on an endless band, in order to get rid of other oxides, such as earth, clay, shales and stone. Following this, the pieces of chromoferrite free from dust should be ground up, and the whole consignment weighed. To every 100 parts of chromoferrite, 1,000 to 1,200 parts of potassium hydrogen sulphate should be added, and fusion of the two should take place. Refusion with anhydrous sodium carbonate is then sometimes necessary, following which potassium nitrate should be added, and calcination at redness take place. The cold mass should then be boiled with water, and insoluble matter filtered off. Hydrochloric acid is then added, followed by a small amount of ammonium nitrate, and the solution evaporated to dryness, filtering off sparingly soluble impurities, which may be deposited during evaporation. The dry mass is redissolved in water, and a little sulphuric acid solution added, the liquor being warmed, and from this the chromic oxide or mixture of oxide and hydroxide can readily be precipitated by the addition of ammonia solution, followed by boiling. It should be filtered off, dried, and calcined if necessary to develop its color.

Chrompicotite Belt Pickings. These consist of small pieces of ferrous chromite with large quantities of alumina, magnesia, manganous oxide, and small quantities of cobalt and nickel, usually in the form of oxides. Cement men will find that the best results are obtained if the material is concentrated severely on an endless band arrangement. Then grind the pieces of chrompicotite to a fine powder. To every ten parts of this offal fifty parts of sodium peroxide and eighty parts of sodium hydroxide are in some cases necessary, intermixture being followed by melting or actual fusion. On lixiviating the cold mass with water, insolubles can be filtered off, and these should be re-fused if necessary until all the chromium is extracted, filtering such solutions again in order to get rid of non-chromic impurities. All the filtrate should then be acidified with sulphuric acid and evaporated, filtering off sodium sulphate in consignments as it is deposited. The chromic hydroxide or mixture of oxide and hydroxide can be precipitated quite easily by the addition of sodium carbonate solution or ammonium hydroxide, and should be well washed, dried, and calcined to develop its color.

Crocoisite or Crocoite Waste. This consists essentially of impure forms of lead chromate. It may be exploited quite readily as a source of chromic oxide green for coloring cements, in the manner described immediately below, although its appearance is as a rule quite distinct from malanchroite.

Malanchroite Mine Waste. This consists of lead chromate with a large number of unwanted impurities. Concentrate it very carefully on an endless band, grind it up, and dissolve it in cold lime water. This solution should be acidified and filtered, following which it should be neutralized by means of soda ash or sodium carbonate solution. The chromate liquor should then be boiled with finely divided sulphur, and the precipitate well washed, dried, and calcined to develop its color.

Phoenicite or Phoenicochroite Pickings. These pickings essentially consist of small pieces of lead sesquichromate or basic chromate, with a very large amount of unwanted gangue. Concentrate them on an endless band arrangement, powder them, and treat with hydrochloric acid. The mixed liquor should then be passed through mechanical filters in order to separate lead chloride, which is practically insoluble. Recently precipitated chromic hydroxide should then be added, and the whole of the chromium precipitated as the hydroxide by pumping through the liquor sulphuretted hydrogen gas. This should be well washed, dried, and calcined to develop its color.

Potassium Chromate Industrial Effluents. These may be exploited in two ways as sources of chromic oxide green. The first method is most applicable to those solutions which are very dilute, while the second is best for the concentrated forms. In any case, however, liquors containing only 1 per cent of potassium chromate should be declined.

The dilute liquors should first of all be filtered to remove suspended impurities, which are apt to be numerous, and should be evaporated to reduce their bulk by one-third, one-half, or two-thirds, according to the approximate quantity of chromate present. Sulphur dioxide gas should then be pumped through this concentrated liquor. It is decomposed thereby, and chromic hydroxide or a mixture of oxide and hydroxide is precipitated. This should be washed, dried, and ignited to develop its color.

The concentrated liquors should be treated rather differently after a preliminary filtering to remove suspended impurities. They should be introduced into capacious multiple evaporating pans, and moisture should be completely driven off; that is, the liquor should be evaporated to dryness. The solid substance may require purification by recrystallization or other means, but in many instances it is in a fit state to be directly mixed with finely divided sulphur. Heat this combination, wash out soluble potassium salts, dry the precipitated hydroxide or mixture of hydroxide and oxide, and calcine it to develop its color.

Potassium Dichromate Waste Waters. While large amounts of these are not usually available, the concentration is a matter of some importance, and owing to the comparatively sparing solubility of this chromium compound compared with certain others, cement men will usually find that they are offered concentrated solutions rather than dilute ones.

The first step in any case consists of filtering these waste waters to get rid of sparingly soluble impurities as completely as possible. Then introduce them into multiple evaporating pans to get rid of a relatively large amount of water, but do not by any means evaporate them to the point of saturation. This strong liquor should be warmed, and hydrogen peroxide added, keeping the liquor warm. This precipitates the chromium in the form of the hydroxide, and it can be filtered off, dried, and ignited to develop its color.

Redingtonite Rough Refuse. This consists mainly of chromium sulphate with combined water, but greatly adulterated with lumps of stone, shale, and other sulphates.

In selecting redingtonite refuse for exploitation the coarser forms should have preference over the more finely divided, and these should be thrown on an endless band arrangement, where lumps of clay and other worthless material is separated therefrom with extreme thoroughness. The concentrated redingtonite should then be ground up, and this powder thoroughly extracted with water, filtering off insoluble impurities. The liquor should be concentrated if necessary in multiple evaporating pans, and the chromium precipitated as the mixed hydroxide and oxide by means of sodium carbonate, sodium hydroxide, ammonium hydroxide, sulphuretted hydrogen, and related forms, washing the precipitate extremely thoroughly, and drying and calcining it in the usual way to develop its color.

Sodium Chromate Waste Solutions. These are not very difficult to exploit as a source of chromic oxide green. The first step again consists of mechanically filtering them to get rid of sparingly soluble matter, and then if they are sufficiently concentrated they can at once be heated with a mixture of sulphuric acid and alcohol, or more accurately with the addition of one followed by the addition of the other. This precipitate should be filtered off, dried, and ignited to develop its color, but the filtrate should be examined, as some chromium is often left in it. If this proves to be the case, it can usually be precipitated quite easily by adding washing soda to it, and then washing, drying, and igniting to develop its color.

Sodium Chrome Alum Unwanted Liquors. In addition to liquors containing sodium chrome alum, cement concerns will sometimes be offered soluble sodium chrome alum in an impure state, this being a by-product of certain organic chemical manufacturing methods. The solid substance should be dissolved in water and the solution filtered, while the unwanted liquors should themselves always be filtered as a starting point. Evaporation of the liquor should then take place until a strong but not actually saturated solution has been obtained, and the chromium precipitated therefrom by the addition of sodium carbonate solution, many other reagents being available, but not giving quite such a good result. This precipitate should be well washed, dried, and strongly ignited to develop its green color to the utmost.

Sodium Dichromate Industry Effluents. These in most instances require to be filtered to start with in order to get rid of sparingly soluble substances. It is then as a rule necessary to neutralize them, partially or completely, by means of soda ash, following which reduction must take place by means of hydrochloric acid and alcohol, this being facilitated by heating the mixed liquors. Further filtration may be necessary, following which precipitate the chromium by means of ammonia solution, sodium carbonate solution, caustic soda solution, or other similar reagents, washing the chromic hydroxide extremely thoroughly, and then drying and igniting it to develop its color.

Proper Proportions

Now with regard to the proportion of chromic oxide green which can safely be mixed with cements, this is subject to considerable variation, as chromic oxide is comparatively chemically inert, just as the other pigments are. Green cements which contain quite a small quantity of this pigment, relatively speaking, are obviously much more economical than those in which large quantities are present, while as I have repeatedly pointed out, if one is using a very deeply tinted cement considerably more cement has to be employed, in order to secure a concrete which will set satisfactorily. This is less pronounced in the case of the green cements than with some of the others, as the actual quantity of the green pigment is a few per cent smaller. Cement men, however, must invariably keep in view, especially with the darkest of all, the fact that a large quantity of an adulterating substance possessing no setting properties whatever is present. Otherwise, the strength of the concrete will be considerably less than when an uncolored cement was employed.

Owing to the cheapness of chromic oxide green prepared from the above unexploited sources, as compared with that obtained from the recognized materials, cements containing it need not be sold at a very close market figure. Not much difficulty is encountered in persuading customers that a green cement, being so much more attractive than an ordinary whitish-grey one, is well worth the additional price asked for it.

Suitable proportions for three shades of green cement are given below:

PALE GREEN CEMENT

	Parts
Cement	950
Chromic oxide	50

Mix the two ingredients very thoroughly together in a dry state, in order to avoid producing a streaky set when the cement is in actual employment.

MEDIUM GREEN CEMENT

This is quite the best formula for general use, and has been extensively employed in Europe.

	Parts
Cement	900
Chromic oxide	100

Mix the two materials extremely thoroughly, as before, and take particular care that the green pigment is in a perfectly dry state.

DEEP RICH GREEN CEMENT

The tint of this is undoubtedly extremely attractive, but as in the case of the other deep shades described in previous articles, it is an extravagant mixture to use, as approximately 15 per cent more than uncolored cement has to be added, if the concrete or cement mortar is to set satisfactorily.

	Parts
Cement	850
Chromic oxide	150

If there is any doubt about the chromic oxide being perfectly dry it should be gently warmed immediately before mixing with the cement. The combination of the two should be ground together over a prolonged period. Otherwise the most intimate incorporation will not be obtained, and with so much pigment present streaky work cannot be avoided.

With this article the subject of unexploited sources of cement makers' coloring agents must be concluded for the present.

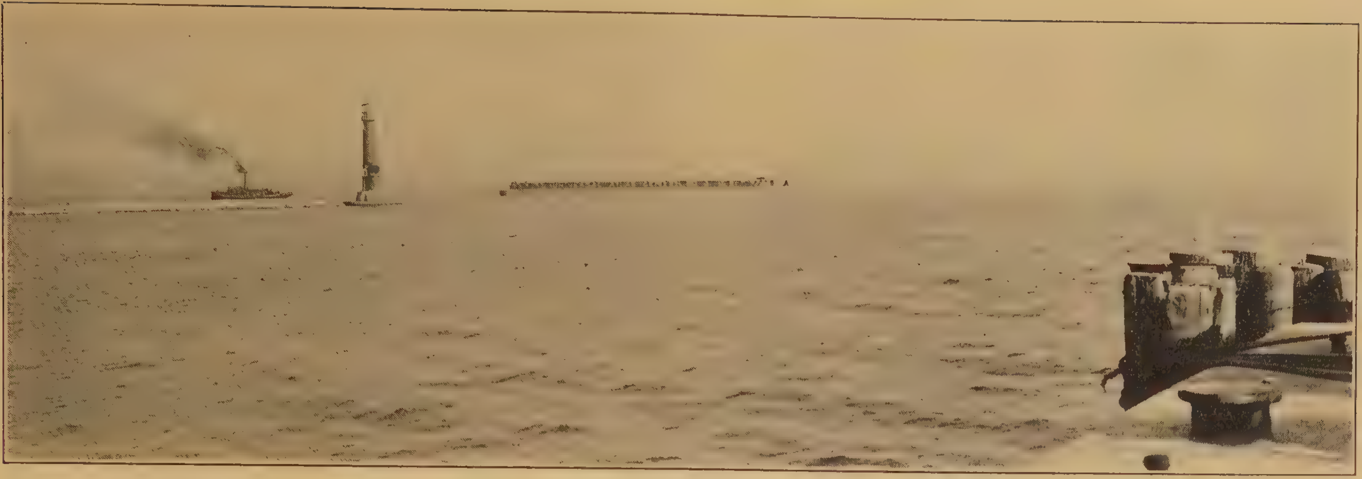
Universal Atlas Distribution Plant at Milwaukee Opens

The new half-million dollar, 50,000-bbl. distribution plant of the Universal Atlas Cement Company at Milwaukee, Wisconsin, began operation on November 24th. The first load of cement, 188 tons, was delivered from the Buffington, Indiana, plant to the silos on November 20th by the company's new barge launched a few days earlier.

The silos are equipped for sack or bulk delivery. Two semi-automatic packing machines fill 60 sacks a minute.

Lehigh Indiana Mill Resumes Operation

Following a shut-down of several weeks for repairs, the Lehigh Portland Cement Company plant at Mitchell, Indiana, resumed operations on December 1st, to run for the rest of the winter.



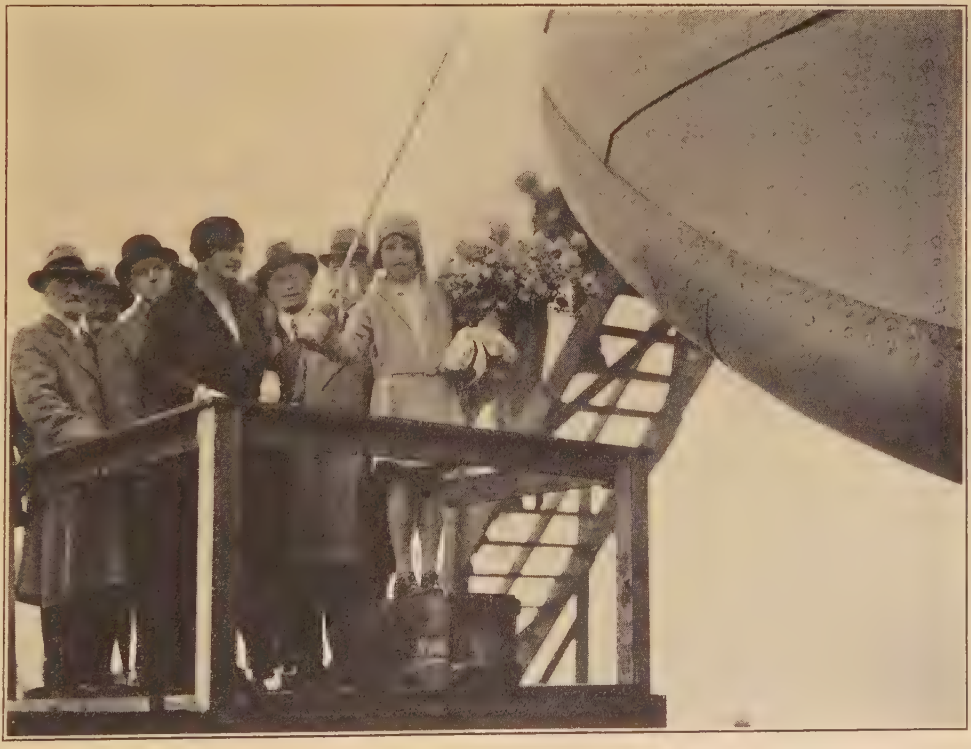
The barge on her first trip with supply of cement for the Milwaukee packing plant of the company

Universal Atlas Bulk Cement Barge Launched In Formal Ceremony

Adds Important Unit to Company's Water Transport Facilities — New Milwaukee Distributing Warehouse Equipped to Receive and Reship Cement

THE Universal Atlas Cement Company's self-unloading bulk cement barge, fully described and illustrated in the November (1930) issue of the Cement Mill Section of CONCRETE, was launched on November 15th with formal ceremonies appropriate to the importance of the event.

S. J. Robison, assistant chief engineer of the Universal Atlas company, who has been in direct charge of the building of the barge, acted as master of ceremonies at the launching. The vessel was christened by Jane Affleck, ten-year-old daughter of B. F. Affleck, president of the



At the christening ceremony. From left to right: A. G. Carlson, chief engineer; Paul C. Van Zandt, assistant to the president; James D. Scovel, district sales manager; Mrs. B. F. Affleck; President B. F. Affleck; F. L. Stone, general sales manager; and Jane Affleck

company. The vessel was christened with the number 51, instead of a name. The launching occurred in the north branch of the Chicago river, at the shipbuilding plant of the Illinois Steel Warehouse Company.

Important Unit in Water Transportation Facilities

The launching of this barge will add an important unit to the water transportation facilities of the Universal Atlas. It is expected that the vessel will be employed largely in transporting bulk cement from the company's plant at Buffington, Indiana, to a distributing warehouse in Milwaukee and other lake points. Along with the development of this plan, the company built several large concrete storage bins on the Milwaukee river, and these are so equipped that either trucks or freight cars can be loaded by mechanical means, direct from the bins.

View of Universal Atlas bulk cement barge No. 51 just before the launching

Equipment Is Electric Driven

As stated in the November issue, the barge is equipped with a Leathem D. Smith self-unloading system and a 10-inch Fuller-Kinyon pump, all unloading equipment being electrically driven. Power is obtained from a connection at the dock. The barge is equipped also with a dust-collecting installation.

The vessel is completely watertight, so that in stormy weather it can be closed effectively against the entry of water, even though completely submerged.

The capacity of the barge is 9,500 barrels of portland cement. The vessel is 226 ft. long and the beam is 40 ft. The molded depth is 12 ft., 6 in., and the depth from the keel to the upper deck is 18 ft.

The barge does not operate under its own power, but is towed by a tug.

Canada Cement Closes Good Year; Sales Undisturbed by Market

Canada Cement Co. for the fiscal year ending November 30th is expected to make a good showing. While the general business depression in the Dominion has adversely affected most other industries, Canada Cement's business has been well maintained, sales running even ahead of the unusually prosperous year of 1929.

The earnings statement for the current fiscal year may not indicate as high a net income as last year, since the company probably will deduct from earnings a portion of expenditures made in improvement of production and distribution facilities.

Partly to stimulate export business, which has not shown much progress in recent years, the company has added to its distribution facilities in Eastern Canada. Last year storage bins and packing plants were completed at Quebec and Halifax, and this year similar buildings have been constructed at St. John. A new 3,500-ton vessel supplies these distributing plants with cement and brings back from Nova Scotia gypsum which is used at the producing plants.

The rapid expansion of the hydro-electric industry in the Dominion, involving construction of a number of huge power plants, has been an important factor in the good business of Canada Cement this year. In addition, several of the provinces have increased their cement-highway mileage, in an effort to attract motor tourists.

Construction projects, now in prospect, will further benefit the company. The $50,000,000 Canadian National Terminal in Montreal, now in preliminary stages of construction, the proposed $65,000,000 subway project in the same city, the large amount of construction work involved in the unemployment relief program sponsored by the Ottawa government, and continuation of hydro-electric developments assures the company of considerable business over the next few years.

The company operates 15 plants in four provinces, with a total productive capacity of 12,000,000 barrels a year.

Leipzig Fair First Week in March

The Leipzig Trade Fair will be held this year from March 1 to 7. The Fair will comprise 10,000 exhibits, assembled from 22 countries. The exhibits of similar merchandise will be displayed in the same manner or closely grouped buildings. An attendance of some 200,000 buyers is expected at the Spring Fair, including 30,000 from foreign countries. The United States will send more than 100 characteristic exhibits and upwards of 2,000 buyers from all parts of the country. A special American headquarters will be established and every facility offered for transacting business. Full information concerning details of the Fair may be obtained by addressing the Leipzig Trade Fair, Inc., 11 West 42nd Street, New York City.

International Declares Dividend

The International Cement Corporation has declared the regular quarterly dividend of $1 on the common stock, payable December 31st to stock of record December 11th.

Cement Statistics for November

1930 Production and Shipments Show Similar Sharp Decreases from Figures of 1929—Stocks Correspondingly Higher

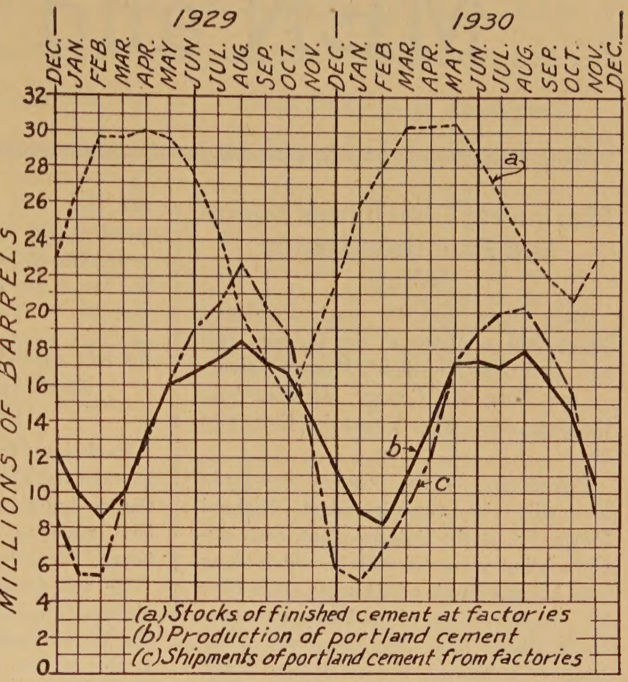
	1929	1930	Increase or Decrease(—) Per Cent
Production, November	**14,053,000**	11,098,000	—21.0
Shipments, November	**11,222,000**	8,784,000	—21.7
Stocks at end of Nov.	18,213,000	**23,011,000**	26.3
Total production for year to date	**158,983,000**	152,425,000	—4.4
Total shipments for year to date	**169,437,000**	153,056,000	—10.7
No. of plants reporting	165	165	....

NOTE: IN ORDER THAT THE READER MAY KNOW THE TREND AT A GLANCE, THE HIGHER FIGURE, WHETHER FOR EITHER YEAR, UNDER ANY CLASSIFICATION, APPEARS IN SLIGHTLY HEAVIER TYPE.

Relation of Production to Capacity

(Figures represent per cent)

	—November—		Oct.	Sept.	Aug.
	1929	1930	1930	1930	1930
The month	**66.6**	51.7	65.4	75.7	81.0
The 12 months ended	**66.8**	62.6	64.2	65.2	65.6



Production, Shipments and Stocks of Finished Portland Cement, by Districts, in November, 1929 and 1930, and Stocks in October, 1930

District	Production—November		Shipments—November		Stocks at end of month —November—		Stocks at end of October,
	1929	1930	1929	1930	1929	1930	1930*
Eastern Pa., N. J. and Md.	**2,973,000**	2,390,000	**2,949,000**	2,124,000	4,020,000	**4,521,000**	4,255,000
New York and Maine	848,000	**924,000**	**738,000**	617,000	1,107,000	**1,395,000**	1,088,000
Ohio, Western Pa., and W. Va.	**1,537,000**	1,085,000	**1,197,000**	830,000	2,580,000	**3,285,000**	3,030,000
Michigan	**1,228,000**	943,000	**667,000**	538,000	1,636,000	**2,722,000**	2,317,000
Wis., Ill., Ind. and Ky.	**1,760,000**	1,233,000	**1,219,000**	857,000	1,869,000	**2,922,000**	2,546,000
Va., Tenn., Ala., Ga., Fla. and La.	**1,085,000**	877,000	**1,025,000**	807,000	1,557,000	**1,767,000**	1,697,000
Eastern Mo., Ia., Minn. and S. Dak.	**1,344,000**	1,131,000	**742,000**	739,000	1,876,000	**1,934,000**	1,542,000
W. Mo., Neb., Kans., Okla. and Ark.	**1,176,000**	743,000	**788,000**	632,000	1,009,000	**1,763,000**	1,652,000
Texas	**661,000**	502,000	**523,000**	453,000	670,000	**770,000**	721,000
Colo., Mont., Utah, Wyo. and Idaho	**120,000**	40,000	**119,000**	118,000	**453,000**	336,000	414,000
California	**1,091,000**	817,000	**1,038,000**	728,000	991,000	**1,052,000**	963,000
Oregon and Washington	230,000	**413,000**	217,000	**341,000**	445,000	**544,000**	472,000
	14,053,000	11,098,000	**11,222,000**	8,784,000	18,213,000	**23,011,000**	20,697,000

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1929 and 1930

Month	—Production—		Shipments		Stocks at end of month	
	1929	1930	1929	1930	1929	1930
January	**9,881,000**	8,498,000	**5,707,000**	4,955,000	26,797,000	**27,081,000**
February	**8,522,000**	8,162,000	5,448,000	**7,012,000**	**29,870,000**	28,249,000
March	9,969,000	**11,225,000**	**10,113,000**	8,826,000	29,724,000	**30,648,000**
April	**13,750,000**	13,521,000	13,325,000	**13,340,000**	30,151,000	**30,867,000**
May	16,151,000	**17,249,000**	16,706,000	**17,224,000**	29,624,000	**30,891,000**
June	16,803,000	**17,239,000**	**18,949,000**	18,781,000	27,505,000	**29,364,000**
July	**17,315,000**	17,078,000	**20,319,000**	20,153,000	24,525,000	**26,289,000**
August	**18,585,000**	17,821,000	**23,052,000**	20,299,000	20,056,000	**23,824,000**
September	**17,223,000**	16,124,000	**19,950,000**	18,083,000	17,325,000	**21,889,000**
October	**16,731,000**	14,410,000	**18,695,000**	15,599,000	15,381,000	***20,697,000**
November	**14,053,000**	11,098,000	**11,222,000**	8,784,000	18,213,000	**23,011,000**
December	11,215,000	....	5,951,000	....	23,538,000	....
	170,198,000	....	169,437,000	....	....	....

*Revised.

MEN and MILLS

Notes from the Field

Marquette Distributes Bonus and Promises Steady Work

More than $40,000 was distributed among 950 employes at the Oglesby, Illinois, and Cape Girardeau, Missouri, plants of the Marquette Cement Manufacturing Company, coming as a surprise Christmas gift.

Presentation of the bonuses was made personally by Superintendent Richard Moyle, Sr., at the Oglesby plant, each employe being presented with his share along with his pay check on Saturday, December 20. Announcement of the bonus was made on December 18th, after executives of the company at Chicago had notified the plants that the bonus would be paid again this year despite slack conditions. Broad smiles overspread the countenances of employes as the word was passed about.

At the same time that he announced the bonuses, Mr. Moyle also declared that prospects are ideal for steady employment to all of the 650 workers at the Oglesby mill during the winter months. When shipment was at its height during the past summer, 750 men were afforded regular employment.

The Christmas bonus plan at the Marquette plants had its inception eight years ago. As a bonus each worker receives one-half of one per cent of his wages for the first year, the bonus percentage increasing in the cases of employes having served the company longer than one year. Employes having long service records receive checks running into a substantial figure.

Ernst Appointed to Conservation Committee of Association

Edgar S. Ernst, chief chemist at the Davenport, Iowa, plant of the Dewey Portland Cement Company, was recently appointed to membership on the conservation committee of the Portland Cement Association.

Meade Company Continues Under Joah Etchells

According to an announcement, the business of Richard K. Meade & Co., at Baltimore, Maryland, will be continued by Joah Etchells, president and general manager. It will, however, be a corporate concern, but will continue in the fields of chemical and industrial engineering.

Mr. Etchells was associated with the late Mr. Meade for fourteen years.

F. O. Anderegg Opens Consulting Practice in Pittsburgh

Frederick O. Anderegg, Ph.D., announces the opening of a consulting practice on building materials, including portland cement, at the Fulton Building, Pittsburgh, Pennsylvania.

He was formerly associate professor of physical chemistry at Purdue University and more recently senior industrial fellow at the Mellon Institute of Industrial Research, in charge of investigations of portland cement and masonry.

H. F. Tyler, Dewey Vice-President, Becomes Father

Herbert F. Tyler, first vice-president of the Dewey Portland Cement Company and in charge of that company's operations at Davenport, Iowa, was the recipient of congratulations from friends on the birth of a son, Loring Herbert, on November 23.

Vice-President C. A. Simpler of Giant Dies

C. A. Simpler, vice-president of the Giant Portland Cement Company, at Philadelphia, died November 27, at his home there.

He was born in Williamsport, Pa., November 27, 1869.

New Dewey Engine House

The Dewey Portland Cement Company is completing a new locomotive house at the Davenport, Iowa, plant. The building is 60 ft. wide by 70 ft. long and was designed by the company's engineers.

J. Singleton-Green Joins Earle Firm

J. Singleton-Green has recently joined the staff of G. & T. Earle, Limited, at Hull, England, as head of the cement company's technical department.

Kellenberger, Iola, Kansas, Foreman, Dies

M. M. Kellenberger, 69, foreman at the Iola, Kansas, plant, died on November 12th.

Great British Cement Magnate Discharged From Bankruptcy

Henry Spence Horne, British cement magnate, has been granted his discharge from bankruptcy, subject to suspension for a year. The debtor was adjudicated a bankrupt in December, 1929.

The official receiver reported that the liabilities were £467,365 ($2,336,825), that the assets would probably realize £68,925 ($344,625), and that a dividend of one shilling or two shillings (24 or 48 cents) in the pound would probably be paid. Mr. Horne retired in 1923 from the stock-broking concern of which he was a member, receiving £20,000 ($100,000) for his interest in the undertaking, and devoted his energies to reorganizing the entire British cement industry.

He acquired interests in a number of big cement companies and was successful in reorganizing the industry, bringing all the companies under one control, with the result that the cost of production decreased, output increased, and the value of the stockholdings was enhanced.

He attributed his insolvency to the unprecedented depreciation during 1929 of his various stockholdings.

Auto Mishap Results in Injuries to F. E. Hufford

F. E. Hufford, traffic manager for the West Penn Cement Company, at Butler, Pennsylvania, had two ribs broken and was badly bruised in an automobile accident while driving to the Butler office on November 13.

Dixon Employes Help Charity Fund

Employes of the Medusa Portland Cement Company plant at Dixon, Illinois, contributed $100 from their relief fund toward the local Goodfellow fund prior to the holidays.

Henson Joins British Cement Manufacturers

Fred J. Henson, formerly with the Minneapolis office of the Portland Cement Association, has joined the Allied Cement Manufacturers, Ltd., Grand Buildings, Northumberland Avenue, London, W. C. 2, England.

About Manufacturers of Equipment

FIELD ACTIVITIES

Fuller Lehigh Moves Plant

According to a recent announcement, the *Fuller Lehigh Company*, a subsidiary of the *Babcock & Wilcox Company*, will move its manufacturing operations and executive offices from Fullerton, Pa. The change is expected to take place within the next few months. The manufacturing operations of the Fuller Lehigh Company are to be consolidated with those of the Babcock & Wilcox Company at its Barberton, Ohio, plant. The executive offices will be located at 85 Liberty Street, New York.

The Fuller Lehigh Company will continue to maintain sales offices in all of the principal cities of the country.

In order to continue a satisfactory service to the cement trade in the East, the Fuller Lehigh Company will provide at Fullerton, a substantial stock of repair parts and Elverite products.

New Pangborn Offices

The Pangborn Corporation, Hagerstown, Md., announces the opening of district sales offices at Cincinnati, Ohio, and Milwaukee, Wisconsin, effective January 1.

E. C. Gilmour is in charge of the Ohio office, and *H. O. Cost* of the Wisconsin office.

Thomas J. Dougherty has been appointed special sales engineer at the home office to cover the Hagerstown district.

Amsco Representatives

Southern Tractor Supply Company, 406 Geer Building, Durham, North Carolina, have been appointed exclusive representatives for the sale of *Amsco* manganese steel crawler tractor links and sprockets in the following territory: District of Columbia, North Carolina, South Carolina, Eastern Tennessee, Virginia, West Virginia.

Hercules Changes Plant Personnel

A number of changes in personnel in the supervision of explosives plant management are announced by officials of *Hercules Powder Company*. In line with the company's policy of promotion and rotation, the following changes are announced by W. C. Hunt, director of operations, Hercules' explosives department:

J. B. Johnson succeeds the late C. F. Bierbauer as superintendent of the Hercules, Calif., explosives plant;

W. S. Brimijoin succeeds *J. B. Johnson* as superintendent of the Emporium, Pa., explosives plant;

L. W. Babcock succeeds *W. S. Brimijoin* as superintendent of the Kenvil, N. J., explosives plant;

M. M. Inskeep succeeds *L. W. Babcock* as assistant superintendent of the Bacchus, Utah, explosives plant, and

Andrew Van Beek succeeds *M. M. Inskeep* as assistant superintendent at Pluto explosives plant, Ishpeming, Mich.

INDUSTRIAL LITERATURE

Underfeed Stoker Catalog

Combustion Engineering Corporation, New York, N. Y., has just issued a new 28-page catalog describing the *Type E Underfeed Stoker.*

This stoker is the pioneer of its class, it is claimed, its wide adoption being evidenced by the fact, that in this country alone, it has been installed under boilers totalling more than one-million rated horsepower. It is recommended for burning either coking or non-coking bituminous coals and for various refuse fuels.

The Type E Stoker is applicable to boilers ranging from 150 hp. up to 600 hp. It may be installed in a battery of two or more boilers. It is said to be mechanically simple and easy to operate.

Included in this catalog are line drawings showing suggested application of this stoker to various types of boilers, a list of representative installations and test data.

Herringbone Gear Booklet

The W. A. Jones Foundry & Machine Company has just issued a forty-page booklet, *No.* 48, on herringbone cut gears. This book is complete, listing in the various pitches gears in three different face widths in both cast iron and steel and covering in its write-up a complete explanation as to how the method is used.

The gears are cut by the Sunderland method on machines purchased in England, and gears more nearly perfect than any that have been manufactured before are now claimed by the Jones company.

Welding Accessories Catalog

A catalog of welding accessories has just been published by the *Fusion Welding Corporation*, Chicago, Ill. A complete line of items is described and illustrated as a guide for those requisitioning and ordering electric arc welding accessories and supplies.

Copies are available upon request.

New Pulverizer Described

The new *Type B Pulverizer* is described and illustrated in *Bulletin 5-80* recently issued by the *Fuller Lehigh Company* of Fullerton, Pa.

The bulletin is well illustrated and describes in detail the construction and operation of the mill. According to the publication, outstanding features include the spherical-ball and grinding ring principle of pulverizing in which fineness is not affected by wear of grinding parts, and the enclosure of all parts requiring lubrication in dust-and-oil tight housings apart from the grinding zone.

Copies of the bulletin are available on request to the company.

From 1875 to 1930

To make available a brief history of its 55 years of existence, the *Link-Belt Company*, Chicago, has published an 8-page booklet, telling of the growth of Link-Belt service to industry.

A second piece of printed matter of the same nature is an illustrated article describing the 1930 developments of the firm. The products and services are briefly described and the former are illustrated on separate sheets.

G-E Super Synchronous Motors

One of the recent publications of the *General Electric Company*, Schenectady, N. Y., that is of maximum interest to the cement manufacturer is *No. 1172A*, on G-E Super Synchronous motors for large grinding and pulverizing mills. It supersedes Bulletin 1172.

Their application, construction, and method of operating are described. A partial list of users is given, and photographs illustrate several applications.

Fuller Publication on Compressors

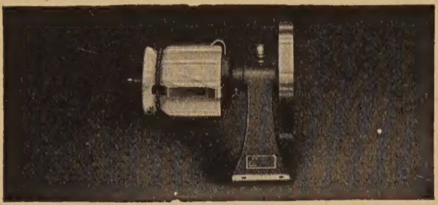
The Fuller Company, Catasauqua, Pa., has issued a bulletin, dated November, 1930, covering its air compressors and vacuum pumps.

The booklet is complete, covering the single-stage, two-stage with intercooler built-in base, and two-stage compressors with separate intercoolers. All dimensions and data except prices are given.

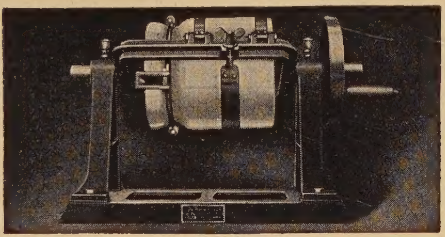
G-E Condensed Catalog

General Condensed catalog (*GC*-6) published by the *Combustion Engineering Corporation*, New York City, illustrates and describes briefly the fuel burning and steam-generating equipment manufactured by the firm.

Laboratory Apparatus for Cement Testing



3674 MILL—Pebble, Single Specimen Type, hand or pulley driven, for grinding or mixing small quantities of substances without contaminating them in any way with metal. The porcelain jar is 5.2 by 5.7 inches and has a dry capacity of ¼ oz. to 1½ lbs. (taking sand as a unit) or a wet capacity of 1 quart. The pulley is 9 by 1 inches and requires 1/12 horsepower when motor driven. Should be operated at 80-120 r.p.m. Complete with 2 lbs. of selected flint pebbles **$16.00**



3682 MILL—Pebble, Assay Type, hand or pulley driven, for grinding or mixing chemicals, enamels, minerals, ores, paints, etc., without contaminating them with metals. The porcelain jar is 8.75 by 9.6 inches and has a dry capacity of 1 oz. to 5 lbs. (taking sand as a unit) or a wet capacity of 1 gallon. The pulley is 9 by 1 inches and requires 1/12 horsepower when motor driven. Should be operated at 55-75 r.p.m. Shipping weight 125 lbs. Complete with 8 lbs. of selected flint pebbles **$35.00**

3683 MILL—Pebble, as above but with tight and loose pulley.......... **$37.00**

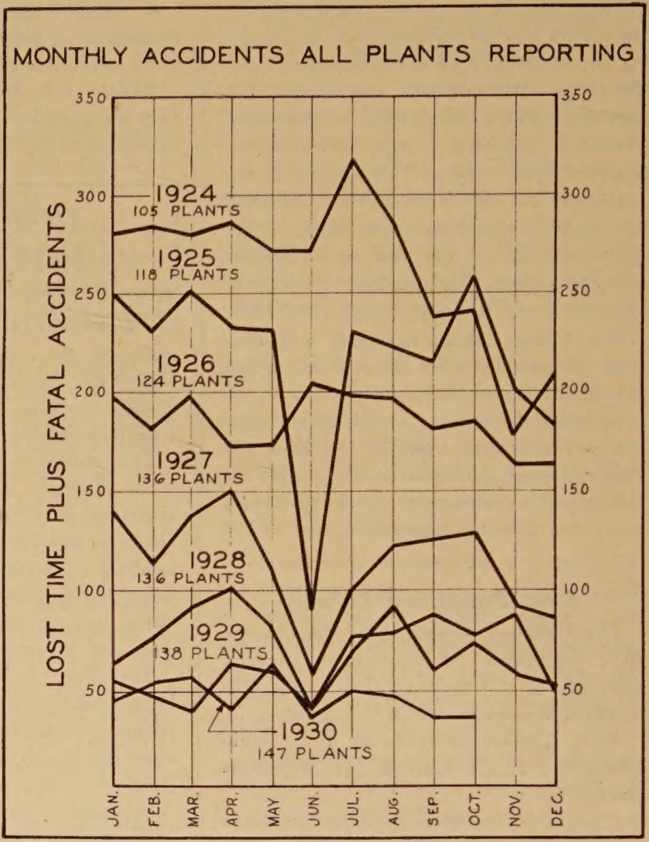
For a complete listing of Cement Testing Apparatus and Chemical Laboratory Apparatus refer to Catalog C. Write for a copy if you do not have one.

THE CHEMICAL RUBBER CO.
Laboratory Apparatus and Chemicals
West 112th Street and Locust Avenue
Cleveland, Ohio

49 Plants Have No Accidents in First Ten Months

October lost-time accidents continue to show a downward trend, the totals being even with the previous month and much below October, 1929, according to figures compiled by the Portland Cement Association committee on accident prevention.

The compilation shows 33 lost-time accidents, plus 4 fatalities, in October. In September there were 35 lost-time accidents, plus 2 fatalities. These figures compare very favorably with October, 1929, when 73 lost-time accidents were reported, plus 3 fatalities.



Dealers Take Official Action on Marketing Plan

The National Builders' Supply Association, at its annual meeting in Chicago on December 8, 1930, took official cognizance of the new cement marketing plan announced by a number of cement manufacturing companies during November and described on page 86 of the December issue of the Cement Mill Section of CONCRETE.

In a closed session the convention adopted a resolution in opposition to the plan, although during the discussion preceding the vote some speakers advised against such action.

It is said, also, that since the date of the N. B. S. A. meeting some influential material dealers have assured the manufacturers that they are well satisfied with the fairness of the plans announced by the cement companies.